Nature conservation field course: Protection of sea turtles (*Caretta caretta*) in Turkey 2013

Projektpraktikum: Schutz von Meeresschildkröten (*Caretta caretta*) in der Türkei 2013

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EXECUTIVE SUMMARY

Kilian Egger-Peitler

Die Unechte Karettschildkröte (*Caretta caretta*) ist eine von sieben Meeresschildkrötenarten und steht auf der Roten Liste der IUCN (*International Union for Conservation of Nature*), sie wird dort als gefährdet eingestuft.
Zum Schutz, weiteren Erhalt und besseren Verstehens der Lebensweise dieser Art wird seit 1994 im Zuge eines Projektpraktikums ein Artenschutz- und Forschungsprojekt der Universität Wien in Kooperation mit verschiedenen Türkischen Universitäten (2013: Pamukkale Universität, Denizli) am Strand von Fethiye durchgeführt. Dieser Strand zählt mit seinen drei großen Abschnitten (Calis, Yaniklar und Akgöl) zu den bekannten 14 Niststränden der *Caretta caretta* im Mittelmeer und wurde zu einem SEPA (Special Environmental Protection Area) Gebiet erklärt. Bei diesem Projekt unterstützten sich heuer Studenten beider Länder bei der Arbeit des Monitoring, des aktiven Artenschutzes und der Datennahme über einen Zeitraum von 11 Wochen (29. Juni – 14. September 2013).

Das Untersuchungsgebiet Fethiye wurde in zwei Teile aufgeteilt, welche jeweils von einer Gruppe von Studenten betreut wurden. Eine Gruppe kümmerte sich um den Strandabschnitt in Calis (ca. 4 km), die andere um Yaniklar (ca. 5 km mit dem Teilabschnitt Akgöl). Auf beiden Stränden wurden Daten über adulte Tiere, deren Nistaktivität, den Hatchlingserfolg, Brutbiologie, Strandentwicklung, und den Einfluss des wachsenden Tourismus und dessen Einflüsse auf die Unechte Karettschildkröte genommen.

Insgesamt wurden in diesem Projektjahr 105 Nester gefunden und betreut. 69 davon wurden in Yaniklar (49) bzw. Akgöl (20) gefunden, und 35 in Calis. Im Vergleich zu den letzten Jahren gab es in beiden Abschnitten unterschiedliche Entwicklungen. So wurden in Yaniklar/Akgöl heuer um sieben Nester weniger gelegt (69) als im Vorjahr (2012: 76 Nester). Hingegen gab es in Calis die höchste Anzahl an Nestern seit Beginn des Projekts in 1994 (36). Mit 35 Nestern übertraf man 2012 (10) um mehr als das Dreifache und stellte auch einen neuen Rekord bezüglich geschlüpfter Hatchlinge auf. Die Hatchlingsrate (=Nisterfolg= hatchlings reaching the sea *100/total number of hatchlings) lag in Yaniklar/Akgöl bei 76,6% (5430 Eier insgesamt) und in Calis bei 74,3% (2780 Eier insgesamt), auch hier wurden die Ergebnisse der letzten Jahre übertroffen. Zusätzlich zu diesen Daten wurden in Yaniklar in drei Nestern sogenannte „Tiny Tags“ angebracht, die während der Inkubationszeit der Eier die Temperatur

des Geleges und Sandes maßen, um mehr über die Brutbiologie zu erfahren. Aus den gewonnenen Daten stellten wir fest, dass die durchschnittliche Nesttemperatur zwischen 30°C und 31°C lag, und die Durchschnittsinkubationszeit der Nester 49,5 Tage betrug.

Diese positiven Entwicklungen wurden aber leider auch von negativen begleitet, so wurden im Laufe der Sommermonate Juni bis September 2013 zehn tote, adulte Meeresschildkröten an den Stränden von Fethiye und Ölüdeniz angespült aufgefunden. Diese Zahl ist somit dreimal höher als 2012 (3 tote Schildkröten). Ihre Todesursachen sind vielfältig und meist von außen nicht zu erkennen, doch hängen sie oft mit dem Menschen zusammen. Kollisionen mit Booten, die Verschmutzung der Weltmeere und Langleinenfischerei zählen zu den Hauptursachen für den Rückgang in der Population der Meeresschildkröten allgemein. Zum Beispiel wurde eine adulte *Caretta caretta* an den Strand gespült, die in einem Fischernetz, welches in der Bucht von Fethiye ausgelegt wurde, ertrank. Die Schildkröte hat sich offensichtlich in diesem Netz verfangen, denn Reste des Netzes konnten auf der Schildkröte festgestellt werden.

Parallel zu diesen biologischen Daten wurden auch humanökologische Daten gesammelt. So wurden wie auch in den letzten Jahren die Veränderungen der Strände (Strandentwicklung) und der Einfluss der Menschen auf die Meeresschildkröten und deren Legeverhalten gemessen und beschrieben. Leider gibt es in beiden Abschnitten Verschlechterungen zu verzeichnen, so nimmt der Tourismus eine immer größere Rolle ein, was negative Folgen mit sich bringt. Die durch den Menschen geschaffenen Probleme (Strand- und Meerverschmutzung, Lichtverschmutz, Bauarbeiten auf und am Strand (Strukturveränderungen), Befahrung und touristische Nutzung) steigen jährlich, was sich in der Anzahl der heurigen toten Schildkröten (siehe oben) und der zahlreichen Veränderungen an den Stränden im Vergleich zu den letzten Jahren widerspiegelt. So befasste sich eine Bachelorarbeit, welche in Akgöl durchgeführt wurde, explizit mit den Veränderungen an diesem Strandabschnitt, wo eine neue Bar mit Sonnenschirmen und -liegen am Strand errichtet wurde, gleichzeitig wurde am östlichen Ende des Strandes in Calis ebenfalls eine neue Strandbar (Spor Café) errichtet und einige bereits seit Jahren bestehende Hotels/Lokalitäten haben ihre Strandnutzung ausgeweitet (z.B. Karaot in Akgöl). Zusätzlich zu diesen strukturellen Veränderungen wurde auch dieses Jahr, im Zuge einer Bachelorarbeit, die Lichtverschmutzung entlang der Promenade in Calis gemessen und mit vergangenen Jahren verglichen. All diese Veränderungen können negative Auswirkungen auf das Legeverhalten der Unechten Karettschildkröte und Verhalten derer Nachkommen auf diesen Stränden in den nächsten Jahren haben.

Neu in diesem Jahr war eine Studie, welches am Strand von Calis durchgeführt wurde. Dabei handelte es sich um eine interdisziplinäre Bachelorarbeit (Umweltpädagogik, Ökologie und Naturschutz), die darauf abzielte einerseits Informationen über den Wissensstand der Touristen bezüglich Meeresschildkröten, und den Erfolg der bereits durchgeführten Öffentlichkeitsarbeit abzufragen. Weiters wurde versucht Bewusstsein für Arten- und Naturschutz bei allen teilnehmenden Altersgruppen (Kleinkinder, Jugendliche und Erwachsene) zu bilden.

The loggerhead sea turtle (*Caretta caretta*) is one of seven sea turtle species and is listed on the IUCN's (International Union for Conservation of Nature) Red List as an "endangered species".

Since 1994 the University of Vienna, in collaboration with various Turkish universities (this year the University of Pamukkale, Denizli), have conducted a course and project to protect, maintain and gain a better understanding of this species. This work has been carried out on the beaches of Fethiye. Fethiye is one of the 14 main nesting beaches in the Mediterranean and was declared a SEPA (Special Environmental Protection Area). In this project, students from both universities cooperated in monitoring, active species conservation and data collection over a period of 11 weeks (29 June - 14 September 2013).

The study area Fethiye was divided into two parts, each of which was monitored by a separate group of students. One group monitored the beach in Calis (ca. 4 km), the other group the beach in Yaniklar (ca. 5 km including the subpart Akgöl). On both beaches, data on adult sea turtles (general constitution and appearance), their nesting activity, the hatchling success, beach development, and the influence of growing tourism and its impacts on the loggerhead sea turtle were collected.

A total of 105 nests were found and monitored in 2013: 69 of them were found in Yaniklar (49) and Akgöl (20), and 35 in Calis. Compared to the last few years, there were different developments in both sections. In Yaniklar/Akgöl we found seven nests less than in the previous year (2012: 76 nests). In contrast, in Calis the highest number of nests was recorded since the project began in 1994 (36). The 35 recorded nests surpassed the 2012 value (10) by more than three times, and also represented a new record with respect to hatched juvenile sea turtles (hatchlings). The hatchling rate (= brooding success = hatchlings reaching the sea * 100/total number of hatchlings) was 76.6 % (5430 total number of eggs) in Yaniklar/Akgöl and 74.3 % (2780 total number of eggs) in Calis. These values also exceeded those of last year. In addition to these data, we buried electronic data loggers (so-called "Tiny Tags") into three of Yaniklar's nests; they measured the temperature of the clutch and sand during the incubation period of the eggs to learn more about the brooding biology. This study revealed that the mean temperature in the three nests was between 30°C and 31°C – values that differed considerably from the ambient temperature – and the mean incubation time was 49.5 days.

These positive developments were accompanied by certain negative events this year. Ten dead, adult sea turtles were found washed up on the beaches of Fethiye and Oludeniz between

June and September 2013; this number was three times higher than in 2012 (3 dead turtles). Although the causes of death are difficult to determine and usually not visible from the outside, they often are related to human activity. Collisions with boats, pollution of the oceans and longline fishery are some of the main causes for the decline in the population of sea turtles in general. For example, one of this year's found dead loggerheads drowned in a fishing net cast in the bay of Fethiye. It was tangled around the corpse when it was washed up the beach.

Parallel to these biological data sets, the students also collected habitat-related data. As in the past few years, we estimated, measured and described the impact of human activities and the consequences of the changes on/of the beach (structural changes) on the sea turtles and their nesting behaviour. Again we recorded negative developments within the two sections of Fethiye beach, mostly related to tourism. Thus, beach pollution, light pollution, construction work on and around the beach (changes in beach structure), and motorized traffic continue unabated. This is reflected in the number of dead turtles (see above) and the various new developments on the beaches compared to the last years. For example: at the nesting hotspot in Akgöl, a bachelor thesis examined visitor numbers and a new bar with umbrellas and sunbeds in front of it; at the eastern end of Calis beach a new beach bar (Spor Café) was constructed, and some of the already existing hotels/facilities expanded their (mis-)use of the beach (i.e. Karaot in Akgöl). Also, this year a bachelor thesis concerning light pollution was conducted: it measured the brightness of the lights along the promenade at Calis beach and compared the values to last year's results. All these developments can impact the nesting behaviour of the loggerhead sea turtle (and their offspring/hatchlings) on these beaches in the coming years.

A new topic this year was an exploratory effort carried out on Calis beach. This interdisciplinary bachelor thesis (combining environmental education, ecology and conservation) examined the state of knowledge amongst tourists regarding sea turtles and queried the success of efforts already undertaken in previous years (success of "Info desk"). It was also designed to build knowledge about and form public awareness of species and nature conservation in all the participating age groups (children, teenagers and adults).

The nesting season of adult *Caretta caretta* at Calış beach (Turkey)

Tina Nagorzanski & Iason Pifeas

KURZFASSUNG

In der diesjährigen Nistsaison der Unechten Karettschildkröte (*Caretta caretta*) in der „Special Environmental Protected Area“ (SEPA) Fethiye, in der Türkei, arbeiteten von 26. Juni bis 14. September 20 Studenten der Universität Wien zusammen mit 8 türkischen Kollegen der Universität von Pamukkale. Einer der zwei Strände befindet sich im touristisch erschlossenen Calış. Entlang der Hälfte des Strandes verläuft eine hoch frequentierte Promenade, die mit vielen Bars, Restaurants, Hotels und Geschäften eine Menge Licht auf den Strand wirft. Während in den letzten Jahren ein Rückgang in der Zahl der Nester in Calış beobachtet wurde, konnte 2013 mit 35 Nestern seit 1994(36) eine Höchstzahl verzeichnet werden. Es wurden 91 Kriechspuren, so genannte „tracks“, gefunden, wovon 27 zu einer erfolgreichen Eiablage führten. Die mittlere Distanz zum Meer der Nester, die entlang der Promenade lagen, betrug 16 m. Nester an Strandabschnitten, die nicht der Promenade vorgelagert waren, hatten eine mittlere Distanz zum Meer von 21,9m. Insgesamt wurden 12 adulte *Caretta caretta* Weibchen während der Schichten entdeckt und mit einem Metalltag an der rechten Vorderflosse markiert.

Der Kurs zum Schutz der Unechten Karettschildkröte bemüht sich, trotz starken Einflusses des touristischen Treibens in Calış, die Population von *Caretta caretta* in diesem Gebiet zu erhalten.

ABSTRACT

In the 2013 loggerhead nesting season, 20 students from the University of Vienna worked in cooperation with 8 Turkish students from the University of Pamukkale from 26 June to 14 September at the special environmental protected area (SEPA) in Fethiye, Turkey. One of the two beaches the field course was monitoring was Calış with its 2.5 km long beach, which is a touristic hotspot. Along almost half of the beach there is a promenade with many bars, hotels and shops. The lights coming from the promenade illuminate the beach, which is a nesting site for *Caretta caretta*, and disturb adult turtles, whilst searching for a suitable spot to lay their eggs. Uninformed tourists on the beach at night are also a problem here. The international team of students monitored the beach in daily morning and night shifts.

While over the last years the number of nests on Calış beach has been decreasing, this year we documented 35 nests, the highest number since 1994. Ninety-one tracks were found, but only

27 of those led to successful nesting. The average distance from the nest to the sea along the promenade was 16.0m, whereas it was 21.2 m for nests offside the promenade. Twelve adult female loggerhead turtles were observed on the beach this year. None of the observed turtles have been tagged and were therefore tagged by the Turkish students in order to better monitor the turtles' migration behavior.

This research and monitoring work is designed to prevent the nesting population of *Caretta caretta* in Calış beach from decreasing, a difficult task considering the impact this touristic hotspot has on the animals.

INTRODUCTION

Of the seven existing sea turtle species, two are known to nest in the Mediterranean Sea, *Chelonia myda*s (green turtle) and *Caretta caretta* (loggerhead urtle), which are both part of the family Cheloniidae. Another species, *Dermochelys coriacaea* (leatherback turtle), belonging to the family Dermochelidae, is a visitor in the Mediterranean Sea but does not nest there. *Eretmochelys imbricata* (hawksbill turtle) and *Lepidochelys kempii* (Kemp's ridley) are also rarely seen in this region. Both nesting species are threatened and classified as "endangered" by the IUCN (International Union for Conservation of Nature and Natural Resources), which means that they are facing a very high risk of extinction in the wild (Marine Turtle Specialist Group 1996; Seminoff, 2004). Because most of the studies on marine turtles show declining populations, they are protected by the Convention for the International Trade in Endangered Species called CITES, by the Bern Convention and the United Nations Environment Program (UNEP-WCMC). Threats that cause these reptiles to be endangered are for example coastal development such as beach restructuring, mainly caused by increasing tourism, fisheries, where sea turtles end up as by-catch, boat strikes or consumption of plastic materials (Casale and Margaritoulis, 2010).

The loggerhead turtle is characterized by a very large head as well as the heart-shaped carapace with a specific arrangement of scutes. Its color is reddish-brown on the dorsal site and yellow to orange on the underside. The straight carapace length (SCL) is around 105 cm and the adult weight can range from 100 to 180 kg (Eckert 1999). Within the age of 15-25 years the female loggerhead turtles reach sexual maturity and start reproducing (Casale et al. 2011). *Caretta caretta* shows nesting site fidelity, which means that they return to the beach at which they hatched to nest, within a range of 50 km and in intervals of 2 to 4 years. In a season, a loggerhead turtle tends to renest again within a range of 5 km from the first nest, laying 1-4 clutches of eggs (Miller et al. 2003). An ethogram made by Hailman and Elowson

(1992) shows that adult loggerhead females start the nesting phase by approaching the beach at night, using the breaking waves to move closer to the beach. The turtle begins crawling inland, trying to find a good nesting spot, often stopping every few meters. When a good spot is found the turtle starts making the body pit, where it sweeps away sand with its limbs and moves its body so that it comes to lie in a circle. After a short break the female digs an egg chamber into the sand as deeply as possible with her hind limbs before beginning to lay the eggs. From the cloacal tube, the turtle starts releasing the eggs into the underlying egg chamber along with mucus, which surrounds the eggs. Up to 100 eggs can be laid by one female loggerhead turtle. When the cloacal tube contacts the laid eggs, the turtle stops laying eggs. The female backfills the egg chamber with sand and starts camouflaging the nesting spot by sweeping sand with her front flippers over her body into the direction of the nest. After the whole procedure, which takes up to an hour, the turtle returns to the sea. If the turtle is disturbed during these actions or can't overcome certain barriers she finds on the beach while looking for a nesting spot, she turns around and stops nesting. Turnarounds and unsuccessful nestings occur in about half of the nesting attempts.

The loggerhead turtle is present worldwide in tropical and warm temperate climates and is the most common sea turtle nesting in the Mediterranean, where the most frequented nesting sites are located in Greece, Cyprus, Libya and Turkey. The average number of nests in the Mediterranean is 7200/year, of which 27% occur in Turkey (Margaritoulis et al. 2003). Bolton and Witherington (2003) list 14 well known nesting sites along the Turkish Mediterranean coast. One of them is the Special Environmental Protected Area (SEPA) Fethiye, which is naturally divided into three subsections Calış, Yaniklar and Akgöl (Fig. 1). Calış beach is 2.5 km long (Ilgaz 2007) and a highly frequented destination for tourists in summer, which leads to innumerous bars, hotels and shops along the promenade followed by sun beds, umbrellas and litter on the beach, as well as light pollution. With all of these disturbances, *Caretta caretta* females are often interrupted while trying to find an adequate spot to nest or can't find any spot at all and crawl back to the sea without laying eggs.

Since 1993 an annual conservation field course run by the University of Vienna in cooperation with various Turkish universities (this year Pamukkale university) has helped protect *Caretta caretta* and the associated nesting sites in Fethiye.

MATERIAL AND METHODS

From 26 June to 14 September, Austrian and Turkish students worked together on Calış beach in Fethiye, Turkey, to protect the endangered species *Caretta caretta*. The work included daily night and morning shifts usually involving 3-4 persons along the 2.5 km (Ilgaz 2007) long coast. The substrate in this area varies from sand to smaller and bigger pebbles. Along half of the Calış coast, where the promenade was situated, the beach is bordered by a wall. Because many tourists didn't know about the loggerhead turtles' situation on the beach they were staying on, we also informed people at an information booth in the evenings about the major issues.

Night shift

The night shifts usually lasted for four hours and were divided into two parts: first shift started at 10pm and the second shift started at 2am. The students began walking on the beach at the end of the promenade at the bar "Türkü Cadiri" to the very end of the beach called "Calış Tepe", where a 15-minute break was held. After this break the students walked back again, so that the beach was altogether patrolled four times during the night. The students walked the beach side by side, i.e. one student walked next to the promenade, one along the waterline and the third between them in the middle of the beach.

The teams, walking the night shifts, took a wooden caliper and measuring tapes with them to measure the tracks and turtles. Later in the season, a bucket was also necessary to collect hatchlings from the nests. Important for the night shifts were also a small red light, flashlights and the data book with a pencil.

If an adult female turtle was encountered during the shift the students sat or lay down on the beach and remained quiet in order not to disturb the animal while trying to nest. After the turtle finished the nesting process and had already camouflaged the nest, or if she couldn't find a nesting spot and started crawling back to the sea, measurements could begin. One of the students held the turtle from behind to avoid being bitten, while another student measured straight carapace length (SCL) and straight carapace width (SCW) with the caliper and curved carapace length (CCL) and width (CCW) with the tape. The students also looked for tags on the turtle's flippers and, if there were none, tagged the turtle with a specific tagging device on the right front flipper. The turtle was also checked for epibionts and injuries and the third team member wrote down all the data collected into the field data book.

After the turtle was released to the sea, the team members looked for the exact location of the nest with a so-called shish (a metal rod) that was carefully stuck into the sand. The sand above

the nest is looser so that the shish could penetrate the sand more easily than in the surrounding area. After finding the nest, a metal cage with a plastic net was set up above it in order to keep hatchlings inside during the night. Because hatchlings were disoriented by the bright lights along the promenade, without a cage, they would run into the wrong direction and towards the wall, increasing their chances of dying from exhaustion. The cages enabled the students to collect hatchlings and release them in a controlled manner on a darker beach area. The cages had plastic nests which had to be put down before night shifts and put up again on morning shifts; this helped avoid trapping the hatchlings in case they hatched during the day.

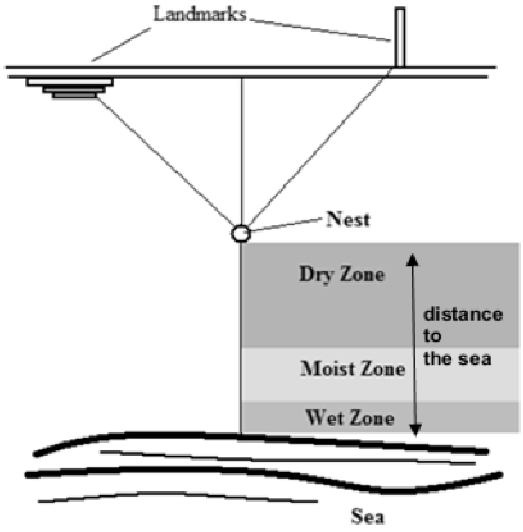

Figure 1 Schematic illustration of a triangulation to secure the position of a nest
Abb. 2: Skizze einer Triangulation (Grätzl & Greistorfer, 2010)

If the team missed turtles going on land, they could still see the tracks the animals left and measured those tracks and nests as well. For each nest a triangulation was done, which means that the distance between three landmarks and the nest were measured (Fig. 2). The distance to the sea, along with the wet, moist and dry zone of the sand, were also determined, as well as the number of body pits and signs of swimming attempts. Track width and length were also important data the students collected

Sometimes the team didn't notice nests until hatching started, because the eggs were laid in June, before students arrived at the field course. These nests were called secret nests (S).

After all measurements were done the tracks were wiped away in order not to collect their data twice.

In mid-August, the night shifts were shortened and the students only walked from Türkü Çadiri to Surf Café. In early September the team only controlled the remaining nests every hour and didn't walk shifts along the whole beach anymore.

Morning shift

Morning shifts started at 6am and were run by 3-4 students in the same way as the night shifts. They lasted for about 2 hours, until 8am. The tasks were to patrol the whole beach, looking for tracks and nests that were made after last night shift. Each nests location was checked again via triangulation measurements, noted in the data book, to determine if cages

have been moved by people visiting the beach. The nests were also checked for hatchlings and the cages' plastic net was pulled up.

RESULTS

Nests

At the 2013 breeding season, 35 nests were found at Calış beach. This was the highest number of nests since 1994 (Fig. 3). This high number of nests from this season exceeds the mean value of nests (19) counted over the past 20 years by 16 that was nearly the double of the long-term average. A strong fluctuation in the number of nests is evident, with slight peaks in the years 1996, 1999, 2007 and 2010. A high peak is also present in 2004 (Fig. 3). Eight of the 35 nests found this year were secret nests, where the egg deposition was not observed. For that reason the exact date when they were dug is not known and no tracks could be measured. The remaining 27 nests were laid between 29 May and 24 August (Tab. 1). For the nests with the numbers C1-C17, no data about the total track length and the number of bodypits were taken. Due to unfavourable conditions, 3 nests (C3, C20, C25) were relocated ("Hatchery": Table 1).

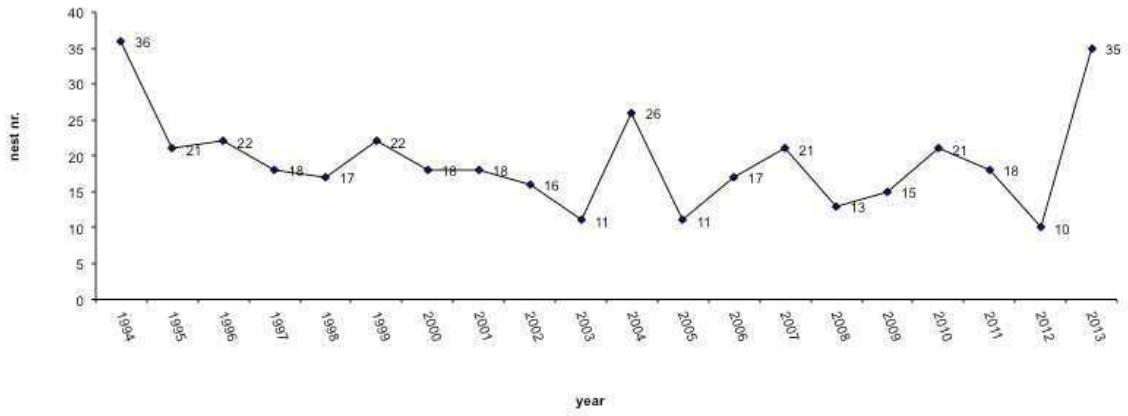

Figure 3: Long-term trend in the nest numbers on Calış beach from 1994 to 2013.
Abbildung 3: Aufzeichnung der gefundenen Nestzahlen am Strand in Calış zwischen 1994 und 2013

Table 1: Overview of the nests at Calış beach in detail. The nests listed as S are secret nests. The average distance to the sea was **15.9** m SD±5.6 (N=35) with an average total track length of **33.3** m SD±11.3 (N=10).
Tabelle 1: Detaillierter Überblick der gefundenen Nester in Calış. Jene Nester, welche mit einem S markiert wurden sind Secret-Nester. Die durchschnittliche Distanz zum Meer betrug **15,9** m SD±5.6 (N=35), mit einer durchschnittlichen totalen Track-Länge von **33,3** m SD±11.3 (N=10).

Nest Nr.	Distance to the sea (m)	Total track length (m)	Track width	Nr. of bodypits	Dry zone (m)	Moist zone (m)	Wet zone (m)	Date of egg deposition	Hatchery (H)
C1	19.0	-	0.67	-	17.0	1.0	1.0	29.05.13	-
C2	12.0	-	-	-	9.0	2.0	1.0	30.05.13	-
C3	13.3	-	-	-	-	-	-	30.05.13	H
C4	13.3	-	-	-	10.3	2.0	1.0	30.05.13	-
C5	13.0	-	-	-	10.0	2.0	1.0	10.06.13	-
C6	13.0	-	-	-	11.0	1.0	1.0	10.06.13	-
C7	10.4	-	0.58	-	2.4	6.0	2.0	14.06.13	-
C8	13.6	-	0.61	-	7.0	4.6	2.0	14.06.13	-
C9	18.4	-	0.55	-	12.4	4.0	2.0	14.06.13	-
C10	8.6	-	-	-	6.6	1.0	1.0	15.06.13	-
C11	21.3	-	0.57	-	17.3	3.0	1.0	22.06.13	-
C12	27.5	-	0.62	-	22.5	2.0	3.0	26.06.13	-
C13	11.2	-	-	-	8.2	1.0	2.0	27.06.13	-
C14	19.0	-	-	-	15.0	3.0	1.0	28.06.13	-
C15	12.0	-	-	-	10.0	1.0	1.0	29.06.13	-
C16	27.0	-	0.50	0	25.0	1.0	1.0	30.06.13	-
C17	13.0	-	0.80	-	11.0	1.0	1.0	01.07.13	-
C18	14.8	31.5	0.57	0	11.9	2.4	0.5	02.07.13	-
C19	18.6	39.5	0.56	0	15.6	2.0	1.0	02.07.13	-
C20	20.8	23.5	0.59	0	-	-	-	03.07.13	H
C21	23.0	45.8	0.69	2	19.0	2.0	2.0	09.07.13	-

Nest Nr.	Distance to the sea (m)	Total track length (m)	Track width	Nr. of bodypits	Dry zone (m)	Moist zone (m)	Wet zone (m)	Date of egg deposition	Hatchery (H)
C22	25.8	55.1	0.75	0	19.8	4.0	2.0	10.07.13	-
C23	13.2	29.1	0.57	1	10.7	2.0	0.5	13.07.13	-
C24	18.4	37.4	0.47	1	16.2	1.2	1.0	17.07.13	-
C25	8.2	20.3	0.72	0	6.1	1.3	0.8	19.07.13	H
C26	13.6	27.8	0.60	2	10.6	1.8	1.2	22.07.13	-
C27	9.8	21.4	0.66	0	5.8	1.8	2.2	24.07.13	-
S1	29.0	-	-	-	25.6	1.9	1.5	-	-
S2	24.4	-	-	-	21.6	1.0	2.0	-	-
S3	30.5	-	-	-	26.5	2.4	1.6	-	-
S4	29.6	-	-	-	27.0	1.7	0.9	-	-
S5	24.3	-	-	-	21.9	1.6	0.8	-	-
S6	19.1	-	-	-	17.2	0.6	1.3	-	-
S7	20.6	-	-	-	18.8	0.3	1.5	-	-
S8	18.3	-	-	-	14.8	2.5	1.0	-	

Twenty-two of the 35 nests were located in the front of the promenade (from Türkü çadiri to Caretta Beach Club), whereas 13 nests were located offside the promenade (from Caretta Beach Club to Çaliş Tepe) (Figs. 5-7). The average distance to the sea from the nests offside the promenade was 32.4% longer than the distance to the sea from the promenade nests (offside promenade 21.19 m SD±6.89, N=13; promenade 16.0 m SD±5.38, N=22).

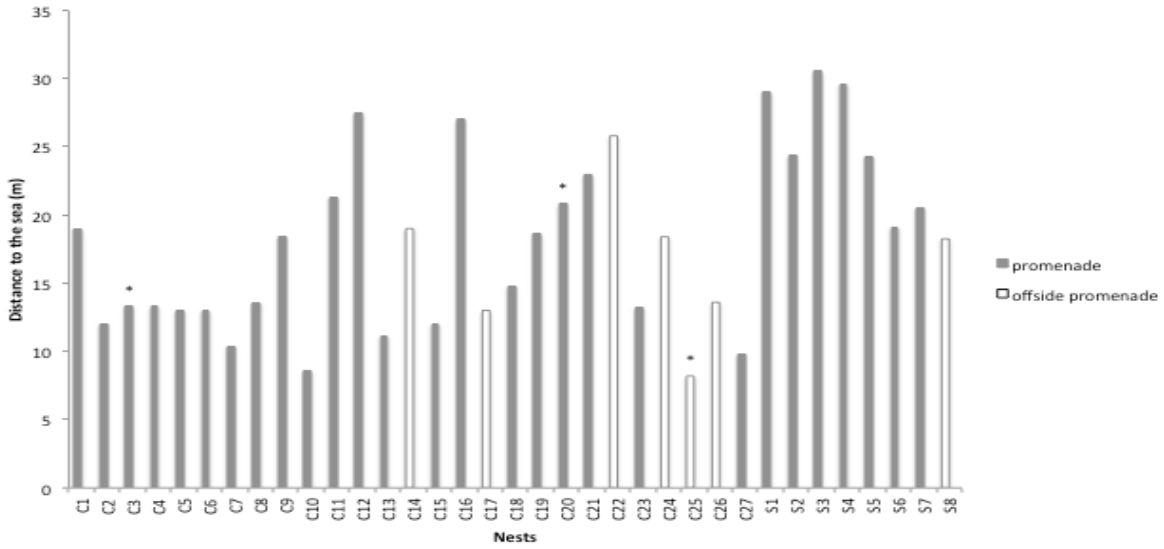

Figure 4: Distance to the sea of all nests Calış Beach. Grey bars indicate nests found in front of promenade, the white bars nests offside promenade. Asterisks mark relocated nests.
Abbildung 4: Distanz zum Meer aller Nester am Strand von Calış. Die grauen Balken stehen für Nester vor der Promenade, weißen Balken beziehen sich auf die Nester außerhalb der Promenade Sternchen im Diagramm markieren verlegte Nester.

Figure 5: Location of nests S1 and S2 at Calış Beach during 2013 nesting season (maps.google.at)
Abbildung 5: Standorte der Nester S1 und S2 in Calış während der Nistsaison 2013 (maps.googel.at)

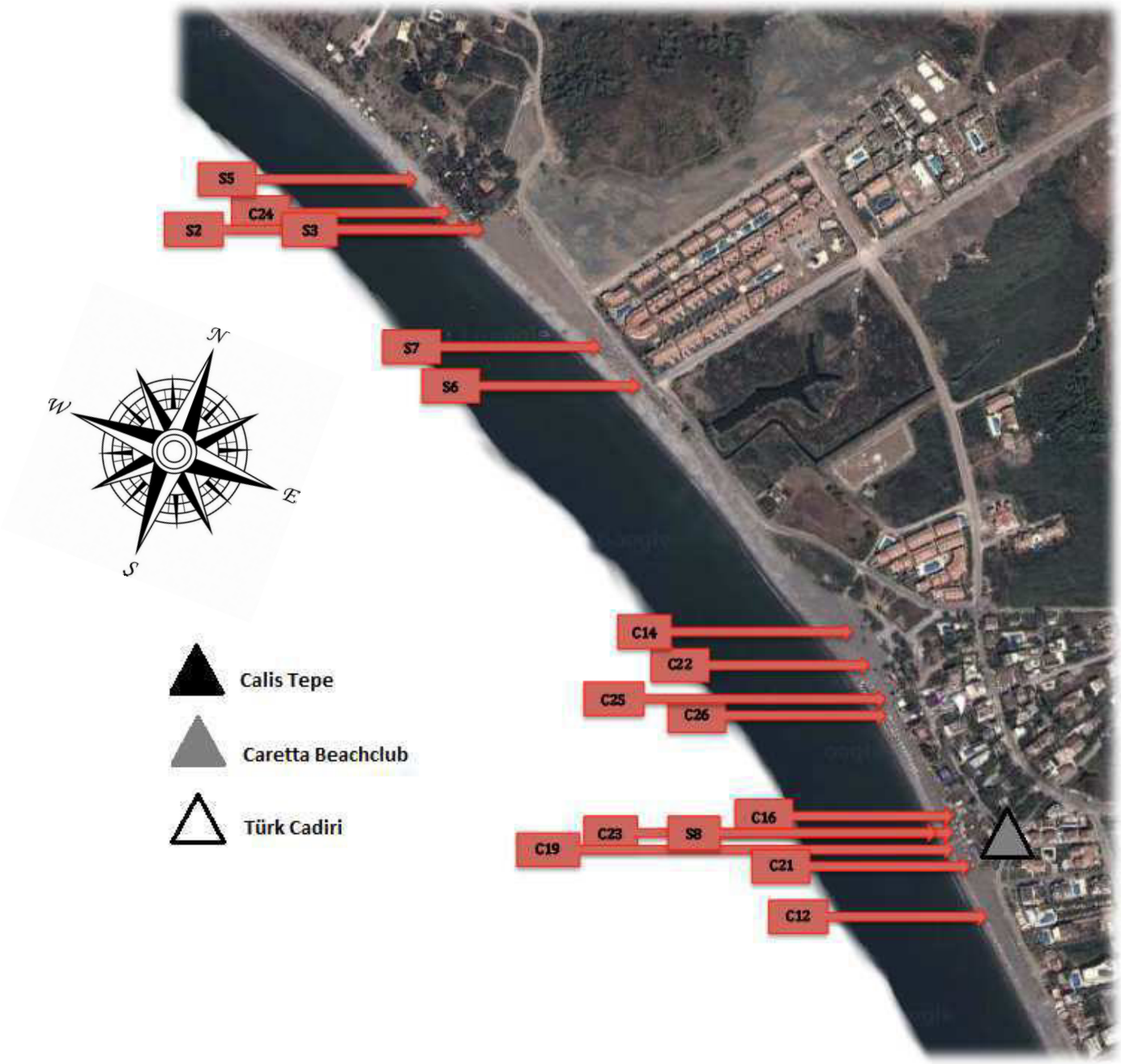

Figure 6: Nest locations on Calış Beach during 2013 nesting season. (maps.googel.at)
Abbildung 6: Standorte der Nester von Calış während Nistsaison 2013.

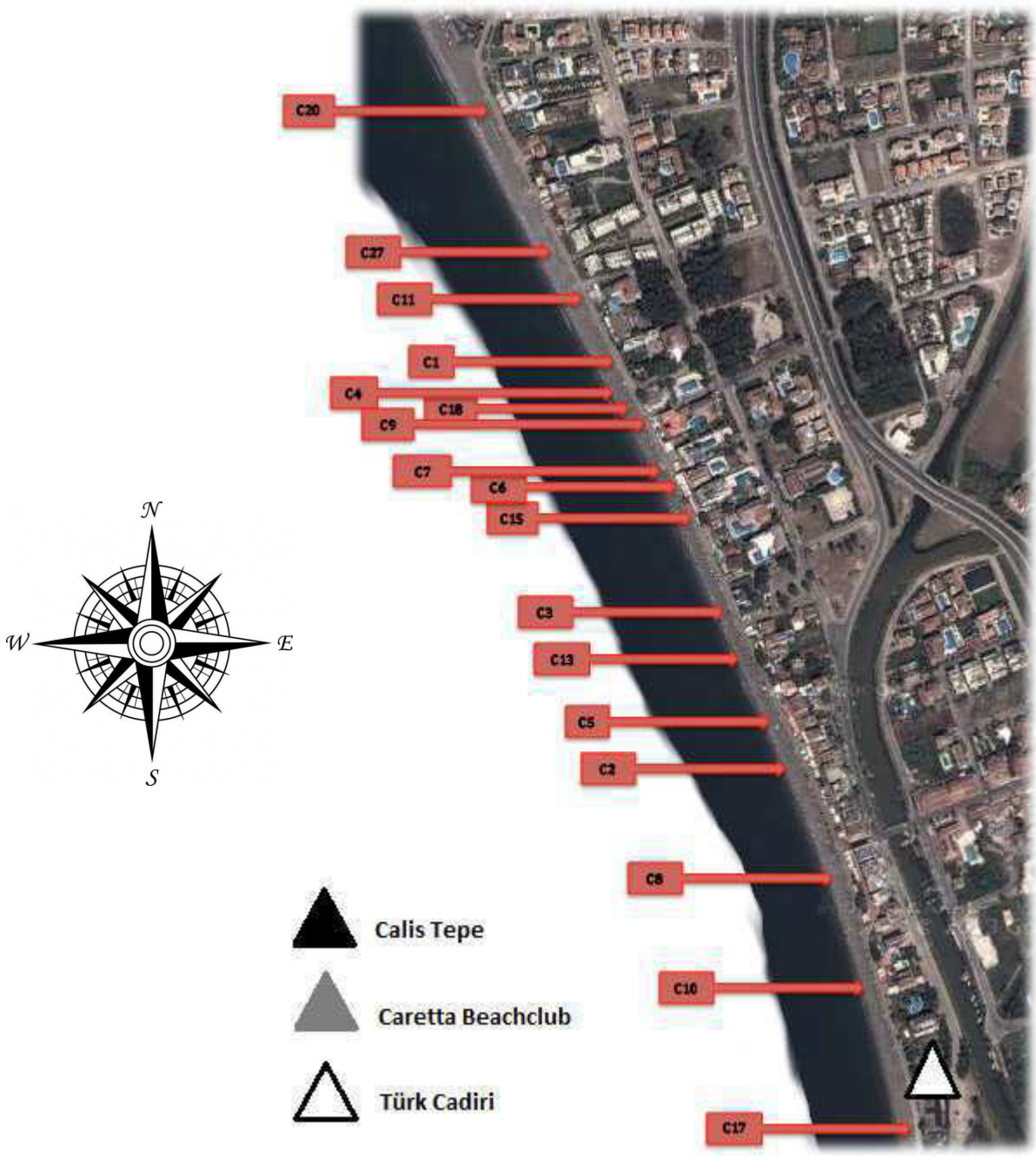

Figure 7: Location of the Nests on Calış Beach during the nesting season 2013. (maps.googel.at)
Abbildung 7: Standorte der Nester in Calış während der Nistsaison 2013. (maps.googel.at)

TRACKS

In the 2013 breeding season, 91 tracks were found at Calış Beach, with an average track width of 63 cm SD±0.07 N=78. Twenty-seven of them resulted in a successful deposition of eggs (C1-27). The remaining 64 attempts at nesting were not successful. The majority of the tracks were offside the promenade (Fig. 9). The total track length at this part of the beach was nearly twice as long as the value in front of the promenade. This also holds true for the distance of the nest to the sea (Fig. 8). All together, 41 bodypits were recorded at the beach.

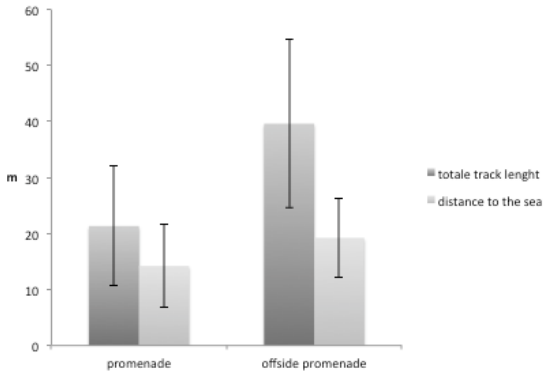

Figure 8: Mean total length and distance to the sea of tracks in front versus offside promenade.
Abbildung 8: Durschnitt der gesamten Länge und Distanz zum Meer von den Tracks vor und außerhalb der Promenade

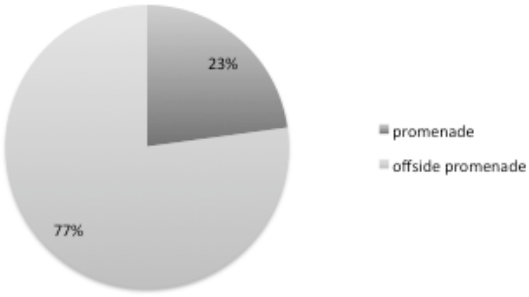

Figure 9: Percentage of the tracks found in front of the promenade and offside the promenade
Abbildung 9: Prozentueller Anteil der gefundenen Tracks vor und außerhalb der Promenade

ADULTS

In the nesting season 2013, 12 adult female sea turtles (*Caretta caretta)* were sighted at Calış Beach. None of them had a tag from earlier years and therefore all were newly tagged by our Turkish colleagues. The turtle with the tag-number TR-Y0306 was spotted twice. The first attempt at nesting (26.6.2013) was unsuccessful, whereas at the second try the turtle deposited the eggs at nest C16 (30.6.2013). Another turtle (TR-Y310) came ashore twice, but also dug only one nest (C21; 9.7.2013) and turned back at the second attempt (21.7.2013). In addition to this, we also observed a turtle (TR-309) which tried to deposit her eggs six times: all tries were disturbed and the turtle went back to the sea.

Table 2: Collected data on tag numbers and carapace measurements of the individual turtles at Çaliş Beach. Epibiont numbers refer to barnacles. (SCL: straight carapace length, SCW: straight carapace width, CCL: curved carapace length, CCW: curved carapace width)
Tabelle 2:Tagnummern und Carapaxabmessungen der einzelnen Schildkröten die am Strand von Çaliş gefunden wurden. Die Zahlen an Epibionten stehen für die Anzahl von Seepocken auf den Schildkröten. (SCL: gerade Carapaxlänge, SCW: Gerade Carapaxbreite, CCL: gekrümmte Carapaxlänge, CCW: gekrümmte Carapaxbreite)

Tag Nr.	SCL	SCW	CCL	CCW	Epibionts
TR-Y0304	69	59	78	72	0
TR-Y0305	73	57	78	73	algae
TR-Y0306	75	50	-	-	0
TR-Y0307	71	58	71	64	0

Tag Nr.	SCL	SCW	CCL	CCW	Epibionts
TR-Y0308	64.3	55.5	73	70	10
TR-Y0309	68	53	83	75	50
TR-Y0310	70	50	71	68	15
TR-Y0311	74	52	77	71	0
TR-Y0312	68.2	52.5	74	67	15
TR-Y0313	73	57	74	68	5
TR-Y0314	65	49	69	59	15
TR-Y0315	67	51	76	62	6

DISCUSSION

This summer, one of the highest numbers of nests was counted at Calış Beach. All together, 35 nests were found along the beach. In contrast the fewest nests ever recorded in Calış were last year (Fig. 3). The conservation and monitoring project at Calış could, itself, be one possible explanation for this situation. This work has promoted nesting and hatching of loggerhead sea turtle (*Caretta caretta)* for the last 20 years: in this interpretation, the first hatchlings helped back to the sea in 1993 could now be returning as adults. In future years we will find out if this positive trend will continue. This year increase in nest numbers could also be a normal fluctuation such as the peak in 2004. Such fluctuation in the nest numbers seems to be quite common, as Figure 3 depicts. In this interpretation, this year's peak does not necessarily indicate a positive trend in the abundance of sea turtles around Calış.

Although artificial lights create a big problem for female sea turtles when they come ashore to lay their eggs into sand, most of the nests were deposited along the crowded and extremely bright promenade (Figs. 5-7)(Preinfalk, 2013). In the lighted beach experiment described by Witherington (1992), many nesting turtles were misdirected by artificial light. So why do female sea turtles potentially prefer the area along the promenade. In Calış the substrate seems to be more suitable for nesting turtles along the promenade than offside the promenade, where larger stones and compacted sand hinder female turtles to dig brood chambers. The higher number of tracks offside the promenade without any nesting achievements supports this interpretation and reflects the fact that along the promenade nesting turtles had a higher

success rate in depositing eggs. Thus, even though nesting turtles are less disturbed by tourists offside the promenade and they apparently spend more time on the beach (as evidenced by longer tracks), they are still less successful (Fig. 8). In this connection, however, note that the beach in front of the promenade is narrower than offside the promenade, which limits total track lengths. To improve the situation for nesting sea turtles in Calış, especially in front of the promenade, there should be a better security to regulate tourists entering the beach after 10pm. The mere fact that most tourists do not even know that entering the beach after 10pm is prohibited underlines that better tourist information is necessary. Moreover, along Calış Beach there are only very few signs dealing with sea turtle protection and no information about the prohibition to walk along the beach at night. It would be also important to protect the nesting sea turtles earlier in summer and not only midway or towards the end of their nesting season. Monitoring should be started in May to make the observation of the loggerhead sea turtle more effective. This problem in organisation seems to be quiet hard to overcome. Because students have to fulfil many commitments at university which makes it impossible to come to Calış earlier. It would be a good idea to recruit volunteers for this project to support students at times when they are not available. This year's positive trend in nest numbers gives reason to hope, but generally the erection of new buildings, which accompany the tourism boom in this area, will have a negative impact on nesting sea turtles. Although the loggerhead sea turtle have survived over 200 million (Brown et al.) years, their future in Calış remains uncertain.

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APPENDIX (all photos taken by Bettina Kliesspiess)

Figure 2: Student getting ready for shift with caliper and hatchling bucket
Abbildung 1: Student mit Schiebelehre und Hatchling-Kübel bereit zur Schicht

Figure 3: older metal metal cage with flexible plastic net going down to the bottom (left); new metal cage without plastic net (right)
Abbildung 1: alter Metallkäfig mit flexiblem Plastiknest das bis zum Boden geht (links); neuer Metallkäfig ohne Plastiknetz (rechts)

Figure 5: Sunbeds and tents build up in the middle of the beach next to the promenade
Abbildung 1: Sonnenliegen und Zelte, aufgestellt am Strand neben der Promenade

Figure 4: Students measuring a nest via triangulation during morning shift
Abbildung 1: Studenten beim Vermessen eines Nests mittels Triangulation während der Morgenschicht

Nesting activity of the Loggerhead turtle, *Caretta caretta,* on the beaches Yaniklar and Akgöl, Turkey

Isabella Beinhauer, Katrina Rosenberger

KURZFASSUNG

Das Nistverhalten von Unechten Karettschildkröten, *Caretta caretta,* an der mediterranen Küste von Yanıklar und Akgöl in der Türkei wurde untersucht. Diese Strände gehören zu den wichtigsten Nistplätzen von *C. caretta* und wurden 1988 zur „Special Protected Area" (SPA) ernannt. Studenten der Universität Wien führten zusammen mit der Pamukkale Universität von 30. Juni bis 14. September eine Studie zum Schutz der Meeresschildkröten durch. Es werden Daten zur Nestverteilung sowie zu Spuren, vermessenen adulten weiblichen Schildkröten und relevante anthropogenen Störungen am Strand dargelegt.

Insgesamt wurden 69 Nester, davon 49 in Yanıklar und 20 in Akgöl, gezählt. Diese Zahlen bestätigen die Abnahme der Nestpopulation und somit den Trend der Beobachtungen der letzten 19 Jahre. Weiters wurden insgesamt 133 Spuren entdeckt, wovon 15 in Yanıklar und 5 in Akgöl zu einem erfolgreichen Nistversuch führten. Die durchschnittliche Distanz zwischen Nest und Meer betrug bei den Nestern in Yanıklar 18,5 m und in Akgöl 27 m.

Die Verteilung der Nester (Hotspot in Akgöl) sowie der Verlauf einiger Spuren lassen auf eine verminderte Strandqualität an manchen Abschnitten sowie auf anthropogene Störungen schließen. Es wurden insgesamt 8 tote adulte Schildkröten in Yanıklar und Akgöl gefunden. Dies könnte auf eine Zunahme der Bedrohungen für die Schildkröten im und außerhalb des Wassers zurückzuführen sein.

ABSTRACT

Nesting activity of the loggerhead sea turtle, *Caretta caretta*, is examined on the Mediterranean coast of Yanıklar and Akgöl, Turkey. These two beaches rank among the most important nesting sites of *C. caretta* and were designated as a Special Protected Area in 1988. This year's study was conducted from 30 June to 14 September by students from the University of Vienna and Pamukkale University in Turkey. Data are presented regarding distribution of nests and tracks, surveyed adult female turtles and relevant anthropogenic disturbances on the beach.

Overall a total of 69 nests, 49 in Yanıklar and 20 in Akgöl, were recorded. Observations over the last 19 years show a decline in the number of nests, which is again supported by the 2013 values. A total of 133 tracks were recorded, 15 of them with a successful nesting attempt in

Yanıklar and 5 in Akgöl. The average distance of a nest to the sea was approx. 18.5 m in Yanıklar and 27 m in Akgöl.

The distribution of nests (nesting hotspot in Akgöl bay) and the course of several tracks lead to the conclusion that beach condition is poor in some sections of the beach and that turtles face anthropogenic disturbances. A total of 8 dead adult turtles were found in Yanıklar and Akgöl, a record number that may reflect increasing threats to turtles in and outside the sea.

INTRODUCTION

In the Mediterranean Sea three sea turtle species can be found: the loggerhead turtle *(Caretta caretta),* the green turtle *(Chelonia mydas)* and the leatherback turtle *(Dermochelys coriacea).* The first two species are recorded as nesting on Mediterranean beaches. As all three sea turtle species are listed as globally endangered and vulnerable by the IUCN (International Union for Conservation of Nature and Natural Resources), they are protected under the 'Convention on International Trade in Endangered Species of wild Fauna and Flora' (CITES) (Broderick & Godley 1996). The major nesting sites of *C. caretta* are located in Greece and Turkey (Groombridge 1990). Baran and Kasparek (1989) identified 17 important nesting grounds in Turkey; among them is Fethiye, where we conducted our studies. Although Fethiye is designated as 'Special Protected Area' (SPA), a severe decline in nest numbers has been observed (e.g. Türkozan 2006; Ilgaz et al. 2007).

Over the past decades, sea turtles in the Mediterranean are faced with increasing threats to their survival. The main threats were found to be: beach development mainly for tourism and recreational use, sand extraction, incidental catch in fisheries, pollution and nest depredation by foxes, jackals and feral dogs (Broderick & Godley 1996). Additionally light pollution, litter, people accessing the beach at night as well as vehicles and beach furniture contribute to an endangerment of sea turtles (Medasset 2011). Lorne and Salmon (2007) showed that artificial lighting affects the ability of hatchlings to orient on land and in the ocean. Further, it weakens their ability to crawl on straight paths to the sea.

Since 1994, Austrian students from the University of Vienna have been invited by several Turkish universities to work together on the *Caretta caretta* sea turtle project. This year it was Pamukkale University which offered us the opportunity to assist within their project.

Starting on 30 June till 14 September, Austrian students collected data on nests, tracks, temperature, adult female loggerhead turtles and hatchlings as well as anthropogenic disturbances. This year's observations of the field course have shown that anthropogenic disturbances continue to increase. Especially litter on the beach, light pollution from

surrounding buildings and beach furniture are major threats, the latter being potentially insuperable obstacles for adult turtles and hatchlings.

Therefore the data collected is necessary to trace the nesting activity of *Caretta caretta* and discover potential declining trends. Additionally, protective measures were taken to secure the survival of the current sea turtle population in Fethiye.

MATERIAL AND METHODS

From the 30 of June to 14 of September, students of the University of Vienna monitored the beaches Yaniklar and Akgöl. The students were split up into two groups, usually consisting of two or three persons. Starting at Onur camp (Fig. 6), one group went to Akgöl Beach (1.5 km) while the other group went to Yaniklar Beach (4.8 km) until they reached Karataş Beach ("small beach", Fig. 10), which was the end of the route. Surveys and data collection were done every day (see below) at both beaches and afterwards transcribed to the data sheets.

Night shifts

Every night between 10 pm and 2 pm, shifts were done until the first hatchlings began to emerge. At this point in the season we had to stop going night shifts to avoid stepping on them in the dark. Alternating shifts were done on Yaniklar Beach or on Akgöl Beach. In a team of three people the beach was monitored for one length, then the students took a 30 minutes break, returned, took a second break and repeated the whole procedure. In Akgöl the students always went to the end of the beach, whereas in Yaniklar they only went as far as to a landmark called "Lonely Tree" (Fig. 8) to avoid crossing a river at night and reducing the monitored stretch to a practical distance. During the shift the team split up parallel to the waterline at different heights to monitor the whole width of the beach in order to prevent overlooking a turtle in the dark. When students encountered a turtle during the shift they immediately stopped, sat down to stay out of its sight and waited quietly not to prevent its attempt of laying a nest. On the turtle's way back to the sea, the team measured its curved and straight carapace width and length. The straight measurements were taken with a wooden sliding caliper, while the curved measurements were taken with a tape measure. Additionally, one person read out the values while another person took notes. Furthermore, epibionts and injuries were recorded and, finally, we looked for tags on the turtle's flippers.

When the first nests began hatching, students put cages above those nests close to light sources; this was done to prevent hatchlings from crawling in the direction of the light instead

of the sea. From 10 pm to 2 am, those nests had to be monitored regularly (every hour) to see if hatchlings had already emerged and, if so, carry them close to the sea to set them free.

Morning shifts

Morning shifts were conducted during the whole time of the project, starting at 5:30 or 6:00 am and lasting until the work was finished (between 8:00 am and 10:00 am). Every morning, two teams, each consisting of at least two people, monitored the beaches. One team surveyed Yaniklar Beach and the other team Akgöl Beach. In the first two weeks the main work consisted of searching for tracks of female turtles and potential nests they had laid at night. From the third week on the students also watched out for hatchling tracks. If an adult track was found, the team measured the track length/width and the distance to the sea (from the farthest part of the track down to the sea). Furthermore, body pits, swimming movements, direction of the track and started chambers were noted. To prevent counting the same track twice, tracks were covered after all the data was collected.

Measuring and marking nests

Potential nests were located with a metal rod ("Şiş"). The rod was pushed into the sand where the nest was expected. If it sank in easily at the depth of an egg chamber, the nest has been found. To avoid losing the nests, they were marked with a semicircle of stones. Some of the stones were marked with the nest number, in Akgöl starting with the letter A (e.g. A1) and in Yaniklar with the letter Y (e.g. Y1). Furthermore two wooden sticks, connected with a string, were buried near the nest surface; if a nest was lost, it could be found by the entangled string on the "Şiş" by dragging it through the sand.

Nests that might be destroyed by cars or tourists were marked with pre-prepared sheets fastened to a 'tripod' made out of three wooden sticks. Additionally all nests were triangulated in order to make sure they could be relocated if they were lost. In Akgöl all of the nests were triangulated using three triangulation points, whereas in Yaniklar we only used two, except for the nests at Karataş Beach where we also used three measuring points.

Nests that were located by the Turkish colleagues prior to our arrival (but where the nest dates were unknown) and nests that were first discovered due to emerging hatchlings were termed secret nests. They were marked as AS in Akgöl and YS in Yaniklar.

RESULTS

The raw data of all nests as well as tracks on the beaches of Akgöl and Yaniklar are included in the Appendix.

Nests

In 2013 a total number of 69 nests were recorded on the beaches of Akgöl and Yaniklar. Compared to last year, this was a lower number of nests, which supports previous overall findings of a steady decrease over the last 19 years.

Most of the nests were located in Yaniklar, namely 49, whereas in Akgöl 20 nests were discovered (Fig. 1). About 28% of the located nests had a known nesting date (Y1-Y15, A1-A5), the other 72% were either found by our Turkish colleagues prior to our arrival and later on due to hatching, so-called „secret nests".

Fig. 1: Number of nests on Yaniklar and Akgöl Beach from 1994 to 2013.
Abb. 1: Anzahl der Nester auf den Stränden Yaniklar und Akgöl von 1994 bis 2013.

The average distance of a nest to the sea was about 27 m in Akgöl (n=21) and 18.5 m in Yaniklar (n=49) (Fig. 2). The distance to the sea was divided into three different zones (wet,

moist, dry). The average distance of all nests was 1.6 m in the wet, 2.6 m in the moist and 17 m in the dry zone.

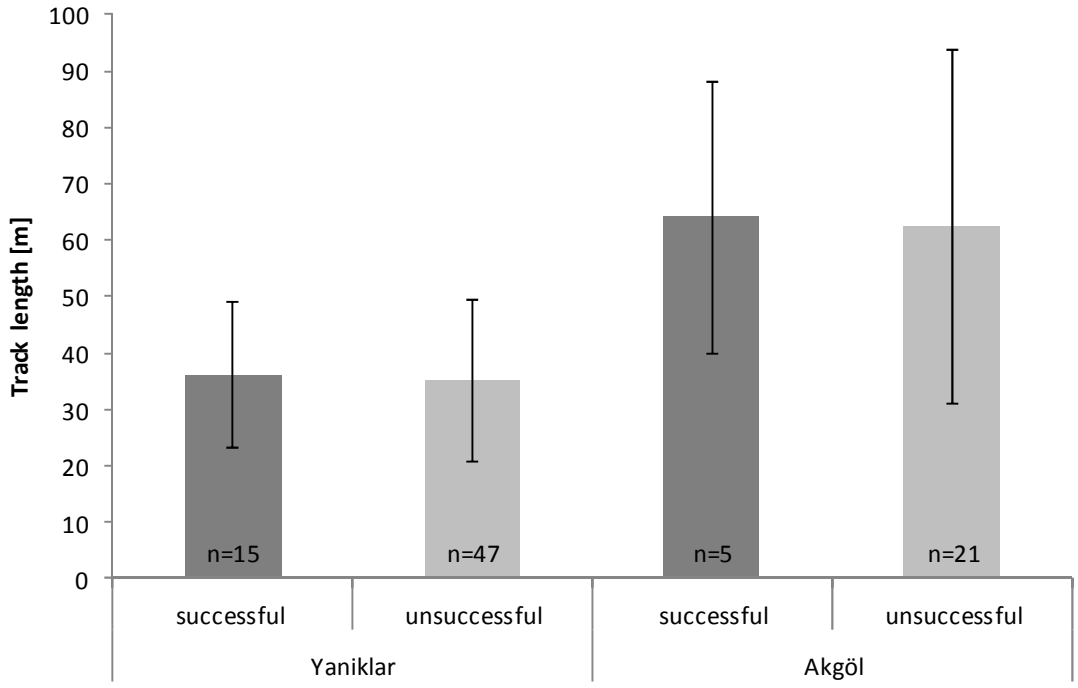

Fig. 2: Average distance to the sea of the nests including standard deviation on Yaniklar and Akgöl beach.
Abb. 2: Mittlere Entfernung der Nester zum Meer inclusive Standardabweichung auf den Stränden Yaniklar und Akgöl.

The nests in Yaniklar and Akgöl were not distributed evenly. In Akgöl, most nests were located at the west end of the beach ('hotspot', Fig. 4). In front of Akgöl Café several pavillions were built (Fig. 3, pavillions are not visible because the picture is from 2011). Three nests were discovered near buildings: one nest (YS1) in Doğa Camp and two in front of Lykia Botanica Hotel, whereof one was located between the kayaks of the watersport site (Fig. 17; see also Fig. 29, Lesch & Mähr, this report). In Yaniklar most of the nests were located between Lykia Botanica Hotel and the "Lonely Tree"; after this landmark there were only six nests on Yaniklar beach and two on Karataş Beach.

Fig. 3: Buildings (blue) and locations of *Caretta caretta* nests (white, red) on Akgöl Beach during the nesting season 2013. The Red cross marks the nesting hotspot.
Abb. 3: Gebäude (blau) und Lage der Nester von *Caretta caretta* (weiß, rot) in Akgöl während der Nistsaison 2013. Das rote Kreuz markiert die hohe Nestdichte.

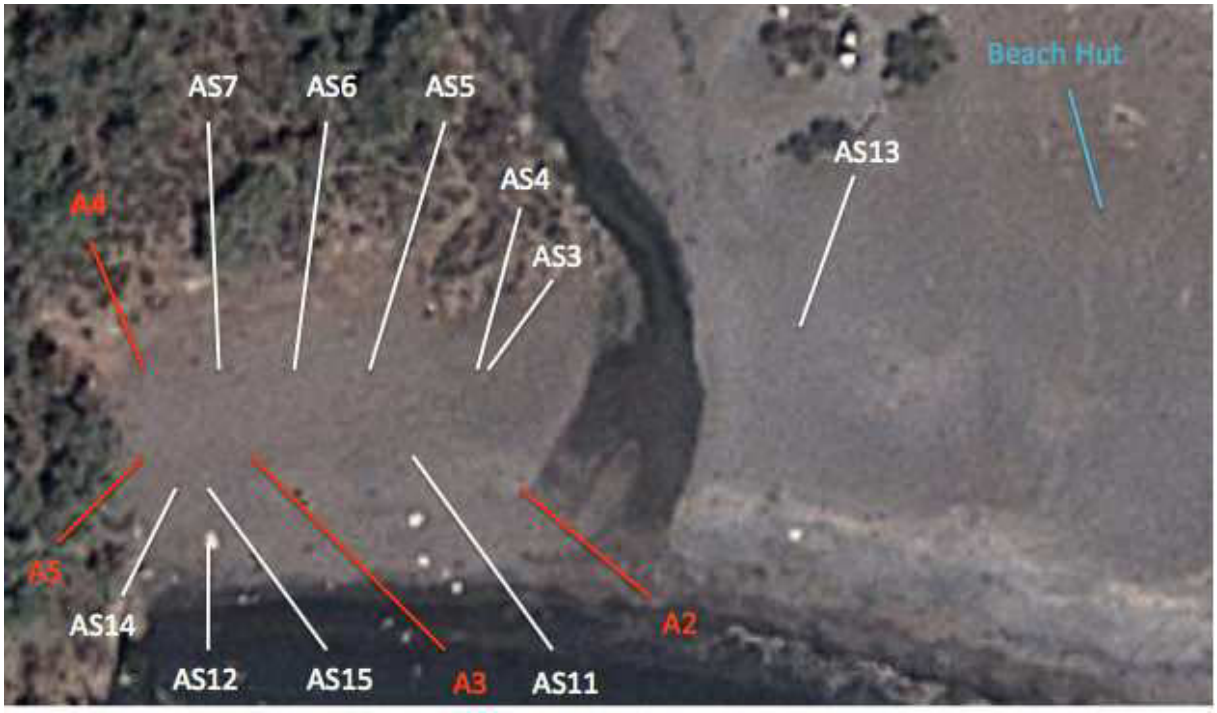

Fig. 4: Location of *Caretta caretta* nests (AS white, A red) of the nesting hotspot at the west end of Akgöl beach. (picture from 2011, google earth)
Abb. 4: Lage der Nester von *Caretta caretta* (AS weiß, A rot) am Westende des Strandes von Akgöl. (Bild von 2011, google earth)

Fig. 5: Hotel (blue) and location of *Caretta caretta* nests (white, red) on Yanıklar Beach during the nesting season 2013. (google earth)
Abb. 5: Hotel (blau) und Lage der Nester von *Caretta caretta* (weiß, rot) in Yanıklar während der Nistsaison 2013. (google earth)

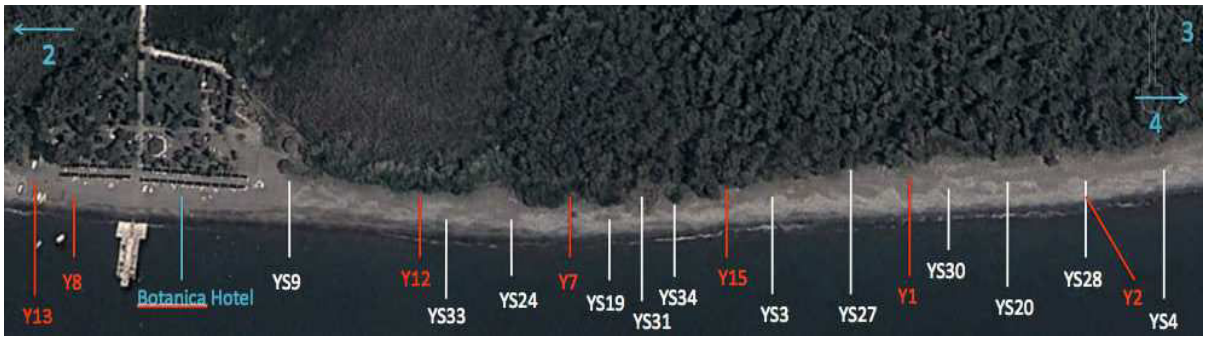

Fig. 6: Hotels (blue) and locations of *Caretta caretta* nests (white, red) on Yanıklar beach during the nesting season 2013. (google earth)
Abb. 6: Hotels (blau) und Lage der Nester von *Caretta caretta* (weiß, rot) in Yanıklar während der Nistsaison 2013. (google earth)

Fig. 7: Location of *Caretta caretta* nests (white, red) on Yanıklar Beach during the nesting season 2013. (google earth)
Abb. 7: Lage der Nester von *Caretta caretta* (weiß, rot) in Yanıklar während der Nistsaison 2013. (google earth)

Fig. 8: Location of *Caretta caretta* nests (white, red) and the landmark “Lonely Tree“ (blue) on Yanıklar Beach during the nesting season 2013. (google earth)
Abb. 8: Lage der Nester von *Caretta caretta* (weiß, rot) und der Orientierungspunkt „Lonely Tree“ (blau) in Yanıklar während der Nistsaison 2013. (google earth)

Fig. 9: Buildings (blue) and locations of *Caretta caretta* nests on Yanıklar Beach during the nesting season 2013. (google earth)
Abb. 9: Gebäude (blau) und Lage der Nester von *Caretta caretta* in Yanıklar während der Nistsaison 2013. (google earth)

Fig. 10: Karatas Beach with the location of *Caretta caretta* nests (red) during the nesting season 2013. (google earth)
Abb. 10: Karatas Strand mit der Lage der Nester von *Caretta caretta* (rot) während der Nistsaison 2013. (google earth)

Tracks

During the morning shifts from 9 June to 9 August, a total of 133 tracks (85 in Yaniklar and 28 in Akgöl) of female loggerhead turtles were recorded. Only a small number of those tracks, namely 15 in Yaniklar and 5 in Akgöl, included a successful nesting attempt (Fig. 11).

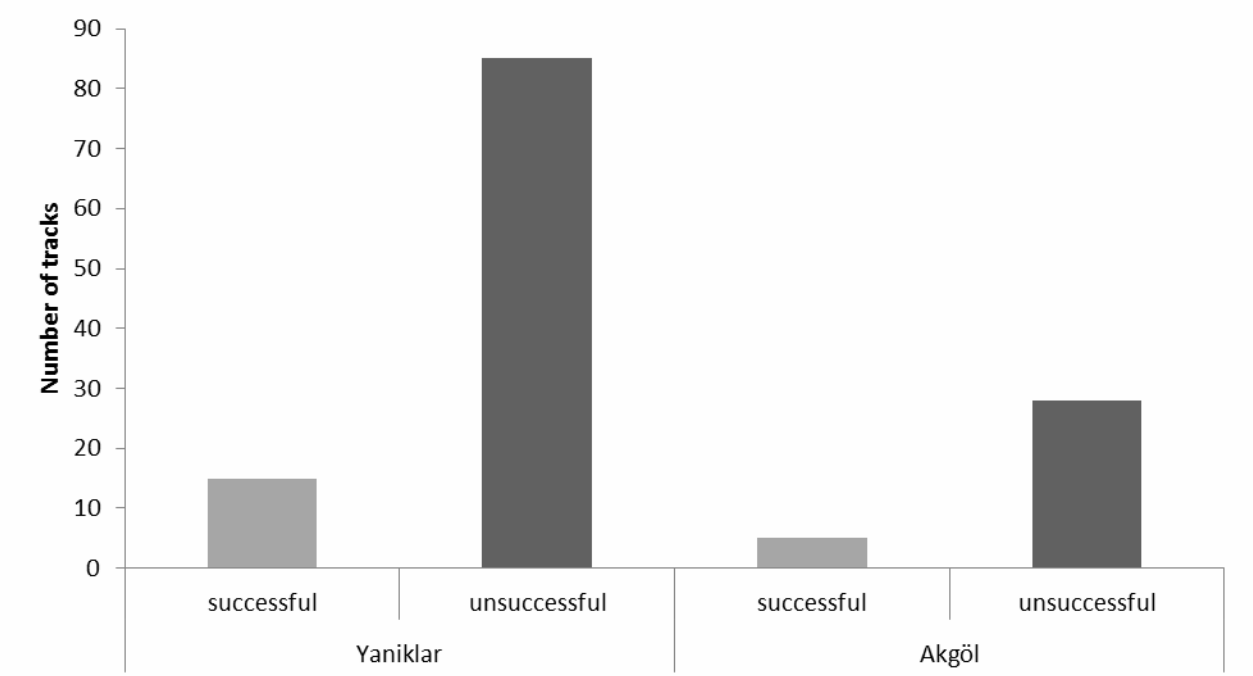

Fig. 11: Number of tracks divided into successful and unsuccessful nesting attempts in Yaniklar and Akgöl Beach
Abb.11 : Anzahl der Spuren mit und ohne erfolgreichen Nistversuch an den Stränden von Yaniklar und Akgöl

The average length of the measured tracks in Akgöl in successful nesting emergences was approx. 64 m and in unsuccessful tracks approx. 62 m, whereas tracks in Yaniklar were only half this length, namely only approx. 36 and 35 m, respectively (Fig.12). Compared to the breeding season 2012, when successful tracks in Yaniklar had an average length of 50 m, this year's tracks are considerably shorter. In contrast, the average length of successful tracks in Akgöl increased considerably compared to the tracks in 2012 (40 m).

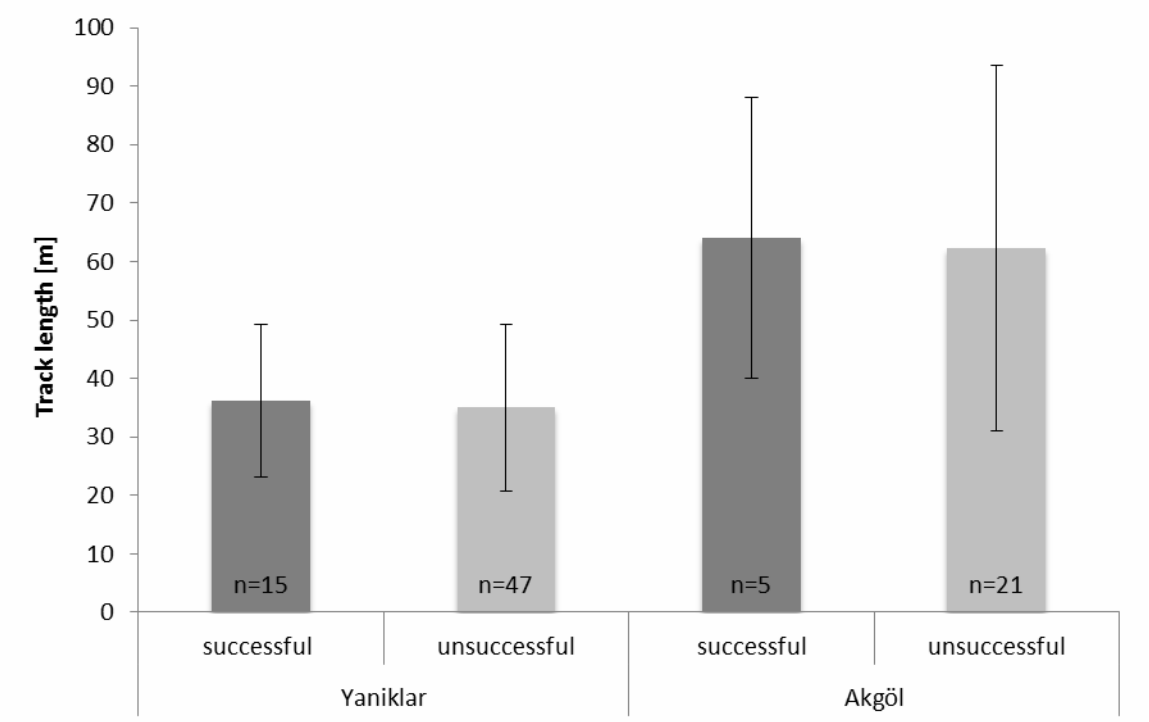

Fig. 12: Average track length of successful and unsuccessful nesting attempts in Yaniklar and Akgöl Beach, including standard deviations
Abb.12 : Mittlere Spurenlänge der erfolgreichen und nicht erfolgreichen Nistversuche in Yaniklar und Akgöl sowie die jeweilige Standardabweichung

Tab. 1: Total number of body pits and started chambers in Yaniklar and Akgöl divided into the categories successful nesting attempt and unsuccessful attempts.
Tab. 1: Gesamtanzahl der body pits und angefangenen Eigruben in Yaniklar und Akgöl, unterteilt in die Kategorien: Spuren mit erfolgreichem (successful) und nicht erfolgreichem (unsuccessful) Nistversuch.

beach	trackcategory (total)	body pits	started chamber
Yaniklar	successful(n=15)	15 (66.6%)	7 (46.6%)
Yaniklar	unsuccessful (n=85)	50 (27.1%)	20 (12.9%)
Akgöl	successful (n=5)	6 (60%)	4 (20%)
Akgöl	unsuccessful (n=25)	13 (25%)	5 (17.9%)

Adults

This year 7 adult female loggerheads were encountered during the night shifts. All these turtles were examined to get important data on carapace size, possible epibionts, injuries or tags. One turtle with a tag (3330A) on her left flipper was encountered, giving us the opportunity to identify her as having been tagged by WWF Italy in Italy. This turtle was incidentally caught by a trawler and was released with a CCL of 69 cm from Lampedusa Island, Italy, on 25 Aug 2007. 2013 the CCL was 74 cm. The average values for straight measurements were 60.9 cm length and 43.7 cm width. The curved carapace measurements were 74.5 cm length and 64 cm width (Fig. 13). Compared with the data of 2012 the turtles were smaller.

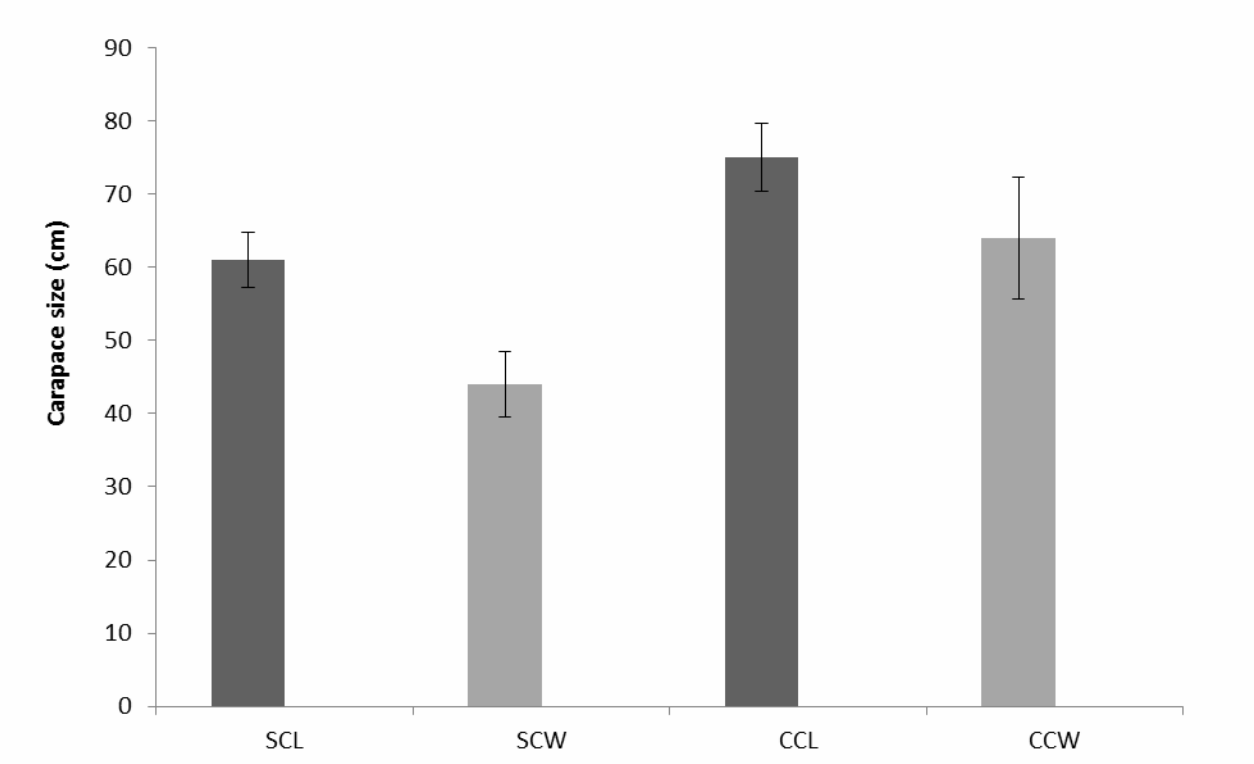

Fig. 13: Average carapace size (in cm) of adult females in 2013 (n=7) including standard deviation. SCL: straight carapace length, SCW: straight carapace width, CCL: curved carapace width, CCW: curved carapace width.
Abb.13 : Mittlere Panzergröße (in cm) der adulten Weibchen (n=7) inklusive Standardabweichung. SCL: gerade Panzerlänge, SCW: gerade Panzerbreite, CCL: gekrümmte Panzerlänge, CCW: gekrümmte Panzerbreite.

DISCUSSION

Nests

Ilgaz et al. (2007) described a declining trend in the loggerhead turtle population in Fethiye between 1993 and 2004. Those results are expanded upon and supported by this year's observations. In 2011 the second lowest number of nests (46) in 19 years of monitoring was recorded. Although this year's nest number is higher (69), it is more comparable to the nest numbers in the poor years before 2004 (Fig. 1). In comparison to the total number of 169 nests that was recorded in Yaniklar before the major drop in 1996, 69 is still a very low value of nests. Potential reasons for the decreasing number of nests are without no doubt industrial fishing, marine pollution, tourism, destruction of the nesting habitats and light pollution.

Anthropogenic influences possibly direct the turtles to undisturbed places on the beach causing hotspots like the one in Akgöl bay (Fig. 4). In Yaniklar the majority of nests was located between Lykia Botanica Hotel and the 'lonely tree', probably reflecting beach condition, i.e. suitable sandy stretches (Figs. 6-8).

Interestingly, two nests were located very close to hotels. One nest (Y13) was discovered between two kayaks of Lykia Botanika watersports and the other one (Y8) close to the hotel disco. A possible explanation is that the sandy substrate was highly suitable close to the hotel; the quality of the substrate, particularly the particle size of the sand is very important to a nesting turtle (Ilgaz et al. 2012).

Tracks

This year, in comparison to the data from 2012, more tracks but fewer nests were observed. From a total of 133 tracks in 2013, 113 did not involve a nest, which provides information of the nesting behaviour of *Caretta caretta* and beach quality (Fig. 11). Only 20 tracks, 5 in Akgöl and 15 in Yaniklar, included a nest. However, many of the unsuccessful tracks also showed body pits and started chambers, which leads to the assumption that it is difficult for female turtles to find an optimal nesting spot here.

Typical loggerhead nesting beaches tend to be sandy, wide and open beaches (Miller et al. 2003), such as the end of the beach in Akgöl, the "bay", where most of the nests were located (Fig. 4). The nesting spot should not be too close to the sea, to avoid excessive humidity in the nest chamber or an inundation of the nest.

During the night shifts we encountered 7 turtles crawling onto the beach, whereof 4 laid a nest. All of the females tested the surface of the beach by making body pits or swimming movements, but they started digging a chamber only when they were not disturbed and the right location was found, they started digging a chamber.

All of the above-mentioned factors influence the turtles in their decision to dig a nest.

Anthropogenic disturbances

An excellent indication of how careful loggerhead turtles choose their nesting site is the comparison of successful and unsuccessful attempts to deposit eggs on the beach. Our observations showed that only 15 tracks out of 100 included a nest in Yaniklar and only 5 of 33 in Akgöl (Fig. 11). The 7 emerging turtles we encountered provided even more information about nesting behaviour. The nesting process is divided into different phases. 'Regardless of the number of steps, the general pattern includes emerging from the surf, ascending the beach, excavating the body pit, digging the egg chamber, oviposition, filling in the egg chamber, filling the body pit, and returning to the sea' (Miller et al. 2003).While ascending the beach, the turtle usually pauses to rest, breathe and scrutinize its surroundings (Pritchard and Trebbau 1984). Especially during this phase, loggerhead turtles, like all marine

turtles, are easily disturbed by predators or anthropogenic disturbances on the beach. Lighting, movement and/or obstacles can cause a change in direction or may even cause the turtle to abandon the nesting effort (Miller et al. 2003). In most of the turtles we observed, there was a tendency to nest on dark sections of the beach; however two of the nests, namely AS1 and AS9, were deposited close to a street-light. This light pollution caused a major problem for the emerging hatchlings because they could not find their way to the sea and crawled in the direction of the light source. According to Witherington & Martin (1996), hatchlings become misdirected on artificial lighted beaches, leaving them unable to find the water and likely to incur high mortality from dehydration and predators.

Other anthropogenic disturbances for adult turtles and hatchlings on the beach included people making bonfires at night (especially in Akgöl close to Majesty Club Tuana), watersports, cars and motorcycles, sunbeds and new bungalows at the beach.

In contrast to last year, we had two nests (Y6 and Y14) on Karataş Beach this year, despite the daily presence of tourists and the poor condition of this small beach caused by litter, big amounts of seaweed and partly very stony sections.

The results of our field course show the importance of suitable and undisturbed nesting sites for *Caretta caretta* as well as the necessity to protect these animals from the increasing anthropogenic disturbances. One way to improve the situation for the sea turtles is to raise awareness in local residents and in tourists by informing them about the circumstances. As in the years before, signs were installed along the two beaches, but mostly in inappropriate locations. To inform the public about the existing regulations of a 'Special Protected Area' prior to their entry, information signs should be installed at the entrance to the beach or close to the hotels.

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APPENDIX I

Tab. 2: Annual number of nests in Akgöl and Yaniklar from 1994 - 2013.
Tab. 2: Jährliche Anzahl der Nester in Akgöl und Yaniklar von 1994 - 2013.

Year	Yaniklar	Akgöl	total
1994	94	22	**116**
1995	133	36	**169**
1996	37	28	**65**
1997	57	28	**85**
1998	78	27	**105**
1999	65	8	**73**
2000	68	23	**91**
2001	79	24	**103**
2002	42	26	**68**
2003	78	17	**95**
2004	25	12	**37**
2005	57	13	**70**
2006	50	9	**59**
2007	55	31	**86**
2008	49	16	**65**
2009	43	34	**77**
2010	49	23	**72**
2011	27	17	**44**
2012	48	28	**76**
2013	49	20	**69**

Tab. 3: Nesting data Yaniklar; Y = nest Yaniklar; YS = secret nest Yaniklar; - = no date or track was observed
Tab. 3: Nestdaten von Yaniklar; Y = nest Yaniklar; YS = secret nest Yaniklar; - = kein Datum oder Spur vermerkt

Date	Nest Nr	Total track length [m]	Track width [m]	Distance to the sea [m]	body pits	Started chamber
30.06.2013	Y1	n.d.	0.87	15	0	1
03.07.2013	Y2	20.9	0.63	10.1	0	1
05.07.2013	Y3	61.4	0.69	29.9	1	0
06.07.2013	Y4	42.6	0.74	19.8	0	0
08.07.2013	Y5	50	0.64	24	3	1
08.07.2013	Y6	24	0.75	10	1	0
09.07.2013	Y7	42.6	0.9	21.2	0	1
10.07.2013	Y8	22.8	0.75	11	1	1
12.07.2013	Y9	32.5	0.8	14.5	1	0
12.07.2013	Y10	46	0.63	19.7	2	1
15.07.2013	Y11	48.6	0.78	21.6	3	0
18.07.2013	Y12	18.4	0.54	15.8	0	0
21.07.2013	Y13	31.5	0.64	13.8	1	1
26.07.2013	Y14	26	0.64	10.5	0	0
02.08.2013	Y15	39.5	0.64	17.9	1	0
-	YS1	-	-	23	-	-
-	YS2	-	-	19	-	-
-	YS3	-	-	15.4	-	-
-	YS4	-	-	21	-	-
-	YS5	-	-	18	-	-
-	YS6	-	-	16.2	-	-
-	YS7	-	-	19	-	-
-	YS8	-	-	25	-	-

Tab. 3: Nesting data Yaniklar; Y = nest Yaniklar; YS = secret nest Yaniklar; - = no date or track was observed
Tab. 3: Nestdaten von Yaniklar; Y = nest Yaniklar; YS = secret nest Yaniklar; - = kein Datum oder Spur vermerkt

Date	Nest Nr	Total track length [m]	Track width [m]	Distance to the sea [m]	body pits	Started chamber
-	YS9	-	-	16.8	-	-
-	YS10	-	-	13.7	-	-
-	YS11	-	-	19.4	-	-
-	YS12	-	-	23.4	-	-
-	YS13	-	-	37.4	-	-
-	YS14	-	-	21.1	-	-
-	YS15	-	-	27.5	-	-
-	YS16	-	-	13.2	-	-
-	YS17	-	-	17.2	-	-
-	YS18	-	-	14	-	-
-	YS19	-	-	20.9	-	-
-	YS20	-	-	19.4	-	-
-	YS21	-	-	20.5	-	-
-	YS22	-	-	19.9	-	-
-	YS23	-	-	18.7	-	-
-	YS24	-	-	15.2	-	-
-	YS25	-	-	22.3	-	-
-	YS26	-	-	11.9	-	-
-	YS27	-	-	15.1	-	-
-	YS28	-	-	24.4	-	-
-	YS29	-	-	17.1	-	-
-	YS30	-	-	11.8	-	-
-	YS31	-	-	19.4	-	-
-	YS32	-	-	21.9	-	-
-	YS33	-	-	15.2	-	-
-	YS34	-	-	17.5	-	-

Tab. 4: Distance to the sea of the nests in Yaniklar; Y = nest Yaniklar; YS = secret nest Yaniklar; - = no date or track was observed
Tab. 4: Distanz zum Meer der Nester in Yaniklar; Y = nest Yaniklar; YS = secret nest Yaniklar; - = kein Datum oder Spur vermerkt

		Distance to the sea [m]			
Date	Nest Nr	Total	Dry	Moist	Wet
30.06.2013	Y1	15	11	3	1
03.07.2013	Y2	10.1	8.1	1.2	0.8
05.07.2013	Y3	29.9	24	5.3	0.6
06.07.2013	Y4	19.8	16.3	2.3	1.2
08.07.2013	Y5	24	22.3	0.7	1
08.07.2013	Y6	10	8.4	0.6	1
09.07.2013	Y7	21.2	18.2	2	1
10.07.2013	Y8	11	8.7	1.3	1
12.07.2013	Y9	14.5	8.4	2.1	4
12.07.2013	Y10	19.7	16.4	2.1	1.2
15.07.2013	Y11	21.6	19.8	1.2	0.6
18.07.2013	Y12	15.8	12	2.7	1.1
21.07.2013	Y13	13.8	10.5	1	2.4
26.07.2013	Y14	10.5	6.5	2.2	1.8
02.08.2013	Y15	17.9	15	1.5	1.4
-	YS1	23	20	1.8	1.2
-	YS2	19	16.1	1.4	1.5
-	YS3	15.4	13.8	0.9	0.7
-	YS4	21	16	3	2
-	YS5	18	16	0.9	1.1

Tab. 4: Distance to the sea of the nests in Yaniklar; Y = nest Yaniklar; YS = secret nest Yaniklar; - = no date or track was observed
Tab. 4: Distanz zum Meer der Nester in Yaniklar; Y = nest Yaniklar; YS = secret nest Yaniklar; - = kein Datum oder Spur vermerkt

		Distance to the sea [m]			
Date	Nest Nr	Total	Dry	Moist	Wet
-	YS6	16.2	13.9	0.9	1.4
-	YS7	19	17.7	0.3	1
-	YS8	25	20.3	2.7	2
-	YS9	16.8	12.2	3.8	0.8
-	YS10	13.7	10.8	1.9	1
-	YS11	19.4	15.9	2.3	1.2
-	YS12	23.4	20	2.3	1.1
-	YS13	37.4	34.3	2.4	0.7
-	YS14	21.1	18.5	1.9	0.7
-	YS15	27.5	25	2	0.5
-	YS16	13.2	10	2	1.2
-	YS17	17.2	14.5	2.1	0.6
-	YS18	14	11.9	0.9	1.2
-	YS19	20.9	13.9	6	1
-	YS20	19.4	16.4	1.8	1.2
-	YS21	20.5	16.5	3	1
-	YS22	19.9	13.9	4.9	1.1
-	YS23	18.7	12.7	3.5	2.5
-	YS24	15.2	12.8	1.8	0.6
-	YS25	22.3	19.7	1.3	1.3
-	YS26	11.9	9.6	0.8	1.5
-	YS27	15.1	12.1	1.9	1.1
-	YS28	24.4	18.4	4.8	1.2
-	YS29	17.1	12.7	1.2	3.1
-	YS30	11.8	7.5	3.3	1
-	YS31	19.4	12.8	4.5	2.4
-	YS32	21.9	18.7	1.2	2
-	YS33	15.2	8.2	5.7	1.3
-	YS34	17.5	10.7	5	1.8

Tab. 5: Unsuccessful emergences in Yanıklar; n.d. = no data available
Tab. 5: Erfolglose Landgänge in Yanıklar; n.d. = keine Daten vorhanden

Date	Total track length [m]	Distance to the sea [m]	Nr of body pits	Started chamber	Track width [m]
09.06.2013	n.d.	5	n.d.	n.d.	0.57
09.06.2013	n.d.	6.2	n.d.	n.d.	0.56
09.06.2013	n.d.	5.2	n.d.	n.d.	0.59
09.06.2013	n.d.	16.2	n.d.	n.d.	0.6
09.06.2013	n.d.	17	n.d.	n.d.	0.58
09.06.2013	n.d.	12	n.d.	n.d.	0.57
09.06.2013	n.d.	13	n.d.	n.d.	0.62
09.06.2013	n.d.	11.4	n.d.	n.d.	0.58
09.06.2013	n.d.	12.8	n.d.	n.d.	0.61
09.06.2013	n.d.	11.6	n.d.	n.d.	0.6
16.06.2013	n.d.	23	n.d.	n.d.	0.69
16.06.2013	n.d.	3.5	n.d.	n.d.	0.69
16.06.2013	n.d.	11	n.d.	n.d.	0.72
16.06.2013	n.d.	10.2	n.d.	n.d.	0.68
16.06.2013	n.d.	15.5	n.d.	n.d.	0.68
19.06.2013	n.d.	15	n.d.	n.d.	0.62
19.06.2013	n.d.	20	n.d.	n.d.	0.65
19.06.2013	n.d.	23	n.d.	n.d.	0.72
19.06.2013	n.d.	25	n.d.	n.d.	0.68

Tab. 5: Unsuccessful emergences in Yanıklar; n.d. = no data available
Tab. 5: Erfolglose Landgänge in Yanıklar; n.d. = keine Daten vorhanden

Date	Total track length [m]	Distance to the sea [m]	Nr of body pits	Started chamber	Track width [m]
19.06.2013	n.d.	21	n.d.	n.d.	0.65
19.06.2013	n.d.	25.5	n.d.	n.d.	0.67
19.06.2013	n.d.	19	n.d.	n.d.	0.72
25.06.2013	n.d.	26	n.d.	n.d.	0.68
25.06.2013	n.d.	25	n.d.	n.d.	n.d.
25.06.2013	n.d.	21.8	n.d.	n.d.	0.71
25.06.2013	n.d.	23	n.d.	n.d.	n.d.
27.06.2013	n.d.	22	n.d.	n.d.	0.54
27.06.2013	n.d.	22	n.d.	n.d.	0.46
27.06.2013	n.d.	n.d.	n.d.	n.d.	0.72
27.06.2013	n.d.	n.d.	n.d.	n.d.	n.d.
27.06.2013	n.d.	n.d.	n.d.	n.d.	n.d.
27.06.2013	n.d.	n.d.	n.d.	n.d.	0.77
30.06.2013	n.d.	n.d.	n.d.	n.d.	0.62
30.06.2013	n.d.	n.d.	n.d.	n.d.	0.72
30.06.2013	n.d.	n.d.	n.d.	n.d.	n.d.
30.06.2013	n.d.	n.d.	n.d.	n.d.	n.d.
30.06.2013	n.d.	n.d.	n.d.	n.d.	0.69
30.06.2013	n.d.	n.d.	1	0	0.47
30.06.2013	n.d.	17	1	0	0.7
02.07.2013	43.2	21.6	1	0	0.64
02.07.2013	26.1	13.8	0	0	0.65
06.07.2013	34.2	18.4	0	0	0.66
06.07.2013	34.5	17.1	0	0	0.69
06.07.2013	25.2	11.8	0	0	0.63
06.07.2013	14.8	7.8	0	0	0.84
07.07.2013	72.2	30.9	2	0	0.63
08.07.2013	41	19.5	0	0	0.61
09.07.2013	33.9	16.7	0	0	0.65
09.07.2013	31.1	12.4	0	0	0.67
09.07.2013	14.7	5.5	0	1	0.6
10.07.2013	17	7.8	0	0	0.88
10.07.2013	31.7	15.7	4	0	0.77
11.07.2013	27.4	14.3	0	0	0.67
11.07.2013	69.4	27.2	6	0	0.63
12.07.2013	34.1	15.6	1	1	0.6
12.07.2013	38.1	18.4	3	0	0.7
12.07.2013	49	17.7	2	1	0.85
12.07.2013	21	10.7	1	0	0.66
12.07.2013	16.2	8.7	1	0	0.74
13.07.2013	35	17	5	0	0.64
13.07.2013	47	21.1	4	0	0.64
13.07.2013	40.2	19.7	1	0	0.61
13.07.2013	43.9	18.8	0	2	0.74
13.07.2013	41.3	18.3	0	0	0.7
14.07.2013	44	17.3	3	0	0.61
17.07.2013	22.6	9.2	0	0	0.52
17.07.2013	50.5	21	4	1	0.63
17.07.2013	40.2	19	0	0	0.63
18.07.2013	23.1	11.5	0	0	0.54
18.07.2013	14.4	7.2	0	0	0.53
19.07.2013	10.5	5.2	0	0	0.62
19.07.2013	44	18.4	3	0	0.62
20.07.2013	46.6	22	2	0	0.64
20.07.2013	61.3	22.7	0	6	0.67

Tab. 5: Unsuccessful emergences in Yanıklar; n.d. = no data available
Tab. 5: Erfolglose Landgänge in Yanıklar; n.d. = keine Daten vorhanden

Date	Total track length [m]	Distance to the sea [m]	Nr of body pits	Started chamber	Track width [m]
24.07.2013	17.3	7.1	0	0	0.65
27.07.2013	23.1	11.8	0	1	0.62
28.07.2013	42.5	19.9	1	0	0.95
28.07.2013	35.3	18.7	1	0	0.73
31.07.2013	41.2	19.2	0	1	0.64
03.08.2013	56.6	10.5	0	0	0.63
03.08.2013	9.3	3.3	0	0	0.66
05.08.2013	40.8	20.6	1	2	0.64
06.08.2013	n.d.	40.6	0	3	0.67
09.08.2013	33.3	15.2	0	1	n.d.
09.08.2013	35.1	18.1	2	0	n.d.

Tab. 6: Nesting data Akgöl; A = nest Akgöl; AS = secret nest Akgöl; - = no date or track was observed
Tab. 6: Nestdaten von Akgöl; A = nest Akgöl; AS = secret nest Akgöl; - = kein Datum oder Spur vermerkt

Date	Nest Nr	Total track length [m]	Track width [m]	Distance to the sea [m]	body pits	Started chamber
30.06.2013	A1	85	0.71	41	3	0
05.07.2013	A2	35	0.83	16	1	0
07.07.2013	A3	63.8	0.61	25	0	0
08.07.2013	A4	90.5	0.63	28.2	0	4
21.07.2013	A5	45.8	0.67	19.8	2	0
-	AS1	-	-	30.6	-	-
-	AS2	-	-	42.2	-	-
-	AS3	-	-	25.5	-	-
-	AS4	-	-	25	-	-
-	AS5	-	-	28.8	-	-
-	AS6	-	-	28.6	-	-
-	AS7	-	-	29.7	-	-
-	AS8	-	-	31.1	-	-
-	AS9	-	-	31.8	-	-
-	AS10	-	-	35.1	-	-
-	AS11	-	-	20	-	-
-	AS12	-	-	15	-	-
-	AS13	-	-	25.3	-	-
-	AS14	-	-	16.1	-	-
-	AS15	-	-	-	-	-

Tab. 7: Distance to the sea of the nests in Akgöl; A = nest Akgöl; AS = secret nest Akgöl; - = no date or track observed
Tab. 7: Distanz zum Meer der Nester in Akgöl; A = nest Akgöl; AS = secret nest Akgöl; - = kein Datum oder pur vermerkt

		Distance to the sea [m]			
Date	Nest Nr	Total	Dry	Moist	Wet
30.06.2013	A1	41	35	4	2
05.07.2013	A2	16	9.9	3.5	2.6
07.07.2013	A3	25	20	3.7	1.3
08.07.2013	A4	28.2	21.8	4	2.4
21.07.2013	A5	19.8	13.8	5.2	0.8
-	AS1	30.6	28	1.4	1.2
-	AS2	42.2	39.7	2.4	1.1
-	AS3	25.5	20	5	0.5
-	AS4	25	20	3	2
-	AS5	28.8	22.4	3	3.4
-	AS6	28.6	22.2	3.3	3.1

Tab. 7: Distance to the sea of the nests in Akgöl; A = nest Akgöl; AS = secret nest Akgöl; - = no date or track observed
Tab. 7: Distanz zum Meer der Nester in Akgöl; A = nest Akgöl; AS = secret nest Akgöl; - = kein Datum oder pur vermerkt

		Distance to the sea [m]			
Date	Nest Nr	Total	Dry	Moist	Wet
-	AS7	29.7	22.4	5.6	1.7
-	AS8	31.1	24	5.2	1.9
-	AS9	31.8	29.3	0.6	1.9
-	AS10	35.1	32.1	1.5	0.7
-	AS11	20	14.8	3.2	2
-	AS12	15	10	3.9	1.1
-	AS13	25.3	23.2	1.1	1
-	AS14	16.1	14.3	1	0.8
-	AS15	n.d.	n.d.	n.d.	n.d.

Tab. 8: Unsuccessful emergences in Akgöl; n.d. = no data available
Tab. 8: Erfolglose Landgänge in Akgöl; n.d. = no data avaiable

Date	Total track length [m]	Distance to the sea [m]	Nr of body pits	Started chamber	Track width [m]
09.06.2013	n.d.	24	n.d.	n.d.	0.72
09.06.2013	n.d.	16	n.d.	n.d.	0.65
09.06.2013	n.d.	18	n.d.	n.d.	0.66
09.06.2013	n.d.	14,3	n.d.	n.d.	0.70
16.06.2013	n.d.	40	n.d.	n.d.	0.69
25.06.2013	n.d.	33	n.d.	n.d.	0.65
30.06.2013	n.d.	34	n.d.	n.d.	0.65
30.06.2013	106.1	43	1	0	0.57
30.06.2013	35.3	32,48	0	0	0.66
01.07.2013	27.2	18	0	1	0.67
01.07.2013	91	36,6	0	1	0.73
01.07.2013	61	29	0	0	0.73
01.07.2013	111	58	0	0	0.73
01.07.2013	108	52	0	1	0.69
09.07.2013	67	n.d.	1	0	0.74
09.07.2013	64	27.8	5	0	0.65
12.07.2013	46.5	20.4	0	0	0.61
12.07.2013	43.6	19.3	0	0	0.65
12.07.2013	62.8	24.8	3	1	0.76
15.07.2013	105.2	52.2	1	0	0.68
18.07.2013	61.1	17.8	0	1	0.65
19.07.2013	108.7	42.2	0	0	0.68
20.07.2013	54.8	20.7	1	0	0.68
22.07.2013	36	18.3	1	0	0.54
22.07.2013	43.5	21.3	0	0	0.53
06.08.2013	12.5	5.5	0	0	0.56
07.08.2013	19.3	8.5	0	0	0.63
08.08.2013	43	19.9	0	0	0.67

Tab. 9: Carapace measurements of adult females. SCL = straight carapace length, SCW = straight carapace width, CCL = curved carapace length, CCW = curved carapace width, x = no nest laid
Tab. 9: Panzerabmessungen der adulten Weibchen. SCL = gerade Panzerlänge, SCW = gerade Panzerbreite, CCL = gekrümmte Panzerlänge, CCW = gekrümmte Panzerbreite, x = kein Nest gelegt

Date	Beach	SCL [m]	SCW [m]	CCL [m]	CCW [m]	Nest
05.07.2013	Akgöl	0,64	0,41	0,71	0,47	A2
08.07.2013	Yaniklar	0,63	0,51	0,74	0,67	Y5
09.07.2013	Akgöl	0,61	0,45	0,69	0,62	x
14.07.2013	Yaniklar	0,53	0,37	0,72	0,66	x
15.07.2013	Yaniklar	0,58	0,39	0,73	0,66	Y11
19.07.2013	Yaniklar	0,65	0,47	0,77	0,64	x
21.07.2013	Yaniklar	0,61	0,45	0,76	0,63	Y13

APPENDIX II

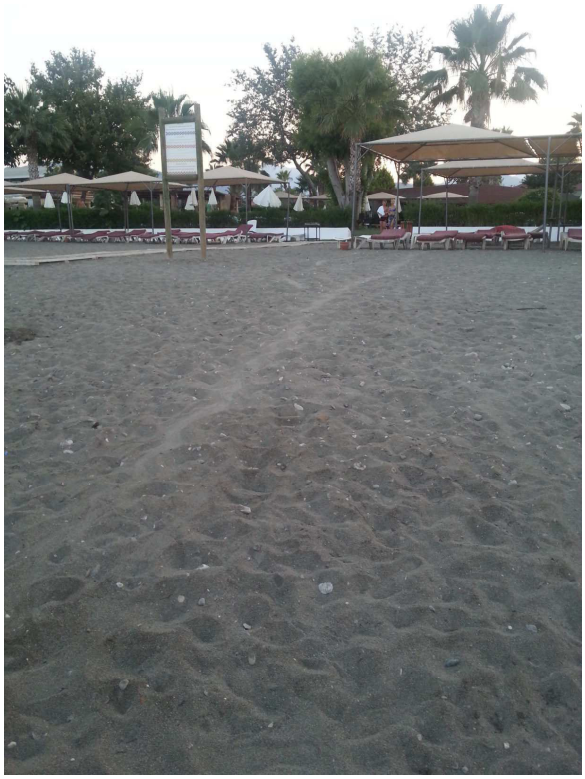

Fig. 14: Adult track in front of Tuana Hotel
Abb. 14: Adulte Spur vor dem Hotel Tuana
(Photo: I. Beinhauer)

Fig. 15: Adult track in Akgöl
Abb. 15: Adulte Spur in Akgöl
(Photo: T. Schaer)

Fig. 16: Adult track with body pits in Akgöl
Abb. 16: Adulte Spur mit „body pits“ in Akgöl (Photo: T. Schaer)

Fig. 17: Nest of *Caretta caretta* between the kayaks of the watersport site of Lykia Botanica Hotel
Abb. 17: Nest von *Caretta caretta* zwischen den Kajaks der Wassersportanlage vom Hotel Botanica. (Photo: C. Mähr)

Fig. 18: Adult track with camouflage on Karatas Beach
Abb. 18: Adulte Spur mit Camouflage in Karatas (Photo: C. Fellhofer-Mihcioglu)

Caretta caretta hatchlings in Çalış 2013

Marina Fischer, Christina Pranger

KURZFASSUNG

Dieser Bericht ist Teil des Projektpraktikums der Universität Wien zum Schutz und Erhalt der Unechten Karettschildkröte (*Caretta caretta*) in der Türkei. Im Jahr 2013 waren insgesamt 11 Studenten aus Österreich zusammen mit Studenten der Pamukkale Universität in Çalış im Einsatz. Çalış gehört zu einem der 14 Niststrände im Mittelmeer von *Caretta caretta* und wurde als Special Environmental Protected Area (SEPA) deklariert. Das Projekt wurde 1994 gegründet und heuer zum 20. Mal durchgeführt.

Im Untersuchungsjahr 2013 wurden in Çalış 35 Nester der Unechten Karettschildkröte (*Caretta caretta*) gefunden. Acht davon waren sogenannte Secret Nests, das heißt, dass man nur aufgrund von Hatchlingspuren oder Hatchlingen selbst das Nest entdeckt hat. Insgesamt wurden 2780 Eier gezählt, von denen 2241 geschlüpft sind und schlussendlich 2066 Hatchlinge erfolgreich ins Meer gelassen wurden. Dies ist seit Beginn des Projekts 1994 die höchste Zahl an Hatchlingen die das Meer erreicht haben. Im Vergleich zum Vorjahr sind das mehr als fünf Mal so viele Hatchlinge. Neben den lebenden Tieren wurden 182 Tote und 109 unbefruchtete Eier gefunden. Von den 414 abgestorbenen Embryos waren 293 im Frühstadium (<1cm), 15 im Mittelstadium (ca. 1cm) sowie 106 im Spätstadium (>1cm). In diesem Sommer betrug die Erfolgsrate in Çalış 74,3% (hatchlings reaching the sea * 100 / total number of eggs).

ABSTRACT

This report is part of the conservation and research field course of the University of Vienna on the loggerhead sea turtle *(Caretta caretta*) in Turkey. A team of 11 Austrian students in collaboration with Turkish students from Pamukkale University worked over eleven weeks on the beach in Çaliş, Fethiye. Together with two other nesting beaches of *Caretta caretta* in the Mediterranean Sea, Çalış has been declared as a Special Environmental Protected Area (SEPA). Out of 14 nesting beaches, only these three beaches in the Mediterranean Sea have this status. The field course was established 1994 and has been conducted for 20 years now. Through accurate and uninterrupted annual monitoring, it is possible to make comparisons between the years and draw some general conclusions.

In 2013, 35 *Caretta caretta* nests were found in Çaliş. Eight of them were so-called secret nests, i.e. they were first detected based on hatchling tracks or hatchlings. Altogether 2780 eggs were counted and, of these, 2241 hatched, whereby 2066 hatchlings ultimately reached

the sea. Since the beginning of this project in 1994, this is the highest number of hatchlings reaching the sea. In comparison with the previous year, the value was five times higher. Besides the living animals, 182 dead hatchlings were found. Additionally, 109 unfertilized eggs and 414 dead embryos were found. The dead embryos can be divided into 293 early-stage embryos (<1 cm), 15 middle-stage embryos (1 cm) and 106 late-stage embryos. In the whole summer the hatching success rate in Çalış was 74.3% (hatchlings reaching the sea * 100 / total number of eggs).

INTRODUCTION

After a female loggerhead sea turtle hatches, it takes her 15-25 years to be ready to mate and return to the beach where she had hatched and lay her eggs. This phenomenon is called natal homing. Adult females have a nesting cycle of 2-4 years and they can dig up to 4 nests per nesting season (Spotila 2004).

There are on average 100 eggs in one nest and it takes the baby turtles 45-50 days to hatch and emerge from their egg chamber. The exact incubation time is influenced by many factors, like temperature and oxygen. The gender of the hatchlings also depends on the temperature of the sand during the middle third of the incubation time (Matsuzawa et al. 2001).

If the sand temperature is below 30 °C, more male turtles will develop and if the temperature is above 30 °C, there are more female turtles in the nest.

Between 2000-2002 about 60-65% of the hatchlings were female, which means that there was a very high proportion of male hatchlings in Fethiye, compared to other nesting places (Kaska et al. 2006). This makes Fethiye one of the most important beaches in the Mediterranean Sea.

Most of the hatchlings emerge at night, but it is also possible that some will hatch during the daytime, making them more likely to die due to heat or predators.

After they dig their way up from the egg chamber, they follow optical cues to orientate themselves on the beach. They crawl towards the brightest light, which is normally the open horizon over the sea and therefore the way to the water. If there are artificial light sources near them, they alter their way and head straight to the light. That is why light pollution is such a big problem for the loggerhead sea turtle *Caretta caretta* (Lohmann et al. 1997).

The loggerhead sea turtle is one of two common sea turtles in the Mediterranean Sea and also has numerous nesting areas in Turkey. In this report that total number of turtles that hatched during summer 2013 on the beach of Çalış is presented and compared to the number of the last years. This provides insights into population trends of the loggerhead Sea Turtle.

Another important aspect of this report is the composition of the nest contents. The number of eggs in each nest on Çalış beach will be shown and compared to the number of unfertilized eggs and dead embryos.

MATERIAL AND METHODS

During the period of 28 June to 11 September the about 2,5 km long beach of Çalış was monitored by a group of Austrian and Turkish students. Altogether there were 21 students from the University of Vienna, each staying for five weeks. The tasks were to find the adult turtles or at least their tracks, measure them, observe the nests and count the hatchlings as well as to excavate the finished nests. These tasks were done in three shifts, one in the morning (6am) and two at night (at 10pm and 12am). The shifts began at the Türkü Çadiri restaurant on the promenade and ended on the northern end of the beach, in front of the cliffs, two hours later in the morning; during the night shifts the monitoring ended at Surf Café. As the morning shifts were much longer, the beach could be controlled only once, whereas during the night shifts the route was from the Türkü Çadiri Restaurant to the Surf Café and back again. This was usually done in a group of four people, two Austrian and two Turkish.

During the first half of the project, approximately till mid-August, it could have been possible that adult female sea turtles emerged to lay their eggs. So while patrolling the beach, the students looked out for adults, tracks or hatchlings. If they found an adult, they waited until she completed oviposition and then measured the animal as well as the exact position of the nest using GPS. To recognize the nest again as well as to protect the eggs, a special cage was put over the nest. Two types of cages were used, on the one hand new pyramid-shaped metal cages with one side open and, on the other hand, the old ones, triangular and closed on all sides with an approximately 1-cm mesh plastic net. This net could be raised and lowered easily, which was necessary for releasing the hatchlings. On top of both cage types there was a sign, either out of metal (new cages) or out of paper in a plastic wrap (old ones), where visitors were informed in three languages (English, German, Turkish) that there is a nest. Because of the bright lights of the promenade, the new cages with the open side were not ideal for the hatchlings: the hatchlings could escape and crawled in the wrong direction. For this reason the new cages were exchanged with the old ones, whose sides were closed, shortly before hatching.

During morning shifts, all the nets surrounding of the potentially hatching nests (from about 40 days after nesting) had to be lifted up several centimetres. This was done so that those turtles emerging during the day would not die due to the sun and the hot sand. If new hatchlings

were found in the morning shift inside the nest, they either were immediately released if the sand was not too hot or they were taken to the sea turtle camp in a bucket filled with moist sand and covered with a moist towel. In this case, they were released to the sea in the following night on a dark place at the beach.

When the sun was setting, the cage nets had to be closed again so that the hatchlings could not escape. From the second half of August on, only nest checks were done because no more emerging adults were expected. All the hatchlings found during the nightshift were collected in a bucket filled with sand and moved to a dark place of the beach. There the students built a small channel in the sand about two metres away from the water and put the turtles in it. In groups of 4 or 5 animals, the hatchlings were released into the sea and were observed until they could not be seen anymore. For this purpose a weak red light was used, so that the hatchlings were not attracted by the lamp. In both shifts (morning and night) the students searched for tracks in the sand to discover potential secret nests. If tracks were found, they were counted and followed to locate the hatchlings. Then the tracks were blurred so that other students would not count them again (on the return path or the next day).

All the data on the turtles, the tracks, the nests and also some information on the weather conditions (temperature and wind strength) were recorded in the journal.

About four days after the last hatching day, each nest had to be excavated. The sand was removed very carefully in order to find the original egg chamber and not to destroy its shape. All the eggs and shells were removed and divided into groups: closed eggs, egg shells, dead turtles or still living hatchlings. The eggs were opened and the embryonic stage was determined, either early (<1 cm), middle (1-2 cm) or late (>2 cm) embryos. If there was no small red point in the egg, it was unfertilized. Finally the depth of the nest, the dry zone, the diameter and the distance to the sea were measured.

Back in the camp, the data were transferred to special datasheets, one for each nest.

The material required for the shift was in a backpack and consisted of the journal, measuring tape, gloves, writing utensils, a thermometer and a red light.

RESULTS

During summer 2013, 35 nests were laid on the beach of Çaliş. Eight of them were secret, which means that the nesting date was unknown.

The average incubation time of the 27 nests with nesting date was 47 (SD±2.6) days and the average number of eggs per nest was 79 (SD±17.6).

In total, 2780 eggs were found, and from these eggs a maximum of 2066 hatchlings reached the sea (Table 1).

The maximum number of hatchlings reaching the sea was here equated with the number of empty shells minus the number of dead hatchlings.

Table 1: Overview of all nests from Çalış 2013 (r.t.s.: reaching the sea); "-"no data
Tabelle 1: Übersicht über alle Nester aus Çalış 2013

Nest Number	Nest date	Incubation time (d)	max hatchling r.t.s.	Still living inside	Empty egg shells	Unfertilized eggs	Fertilized eggs	Dead hatch-lings	Dead embryos	Total number of eggs
C1	29.5	48	41	0	50	14	63	9	4	77
C2	30.5	49	38	4	48	13	61	17	6	74
C3	30.5	-	0	0	0	4	18	0	18	22
C4	30.5	49	71	1	74	5	89	3	15	94
C5	10.6	51	84	3	91	0	95	7	4	95
C6	10.6	51	71	0	73	1	75	2	2	76
C7	14.6	48	84	1	89	1	99	5	10	100
C8	14.6	45	45	3	48	6	69	3	21	75
C9	14.6	50	67	0	67	0	70	2	3	70
C10	15.6	-	5	1	5	3	93	0	88	96
C11	22.6	45	36	5	44	1	77	8	33	78
C12	26.6	42	66	7	70	3	93	4	23	96
C13	27.6	52	74	2	74	0	75	0	1	75
C14	28.6	50	32	28	45	8	56	13	11	64
C15	29.6	47	45	1	45	11	71	0	26	82
C16	30.6	45	53	1	54	1	70	1	16	71
C17	1.7	45	71	6	85	0	85	14	0	85
C18	2.7	47	75	0	76	1	78	1	2	79
C19	3.7	48	63	9	66	0	74	3	8	74
C20	3.7	45	50	2	59	0	75	9	16	75
C21	9.7	46	70	9	80	1	88	10	8	89
C22	10.7	43	58	14	65	1	66	7	1	67
C23	13.7	46	59	1	61	0	68	2	7	68

Table 1 (cont.): Overview of all nests from Çalış 2013 (r.t.s.: reaching the sea)
Tabelle 1: Übersicht über alle Nester aus Çalış 2013

Nest Number	Nest date	Incubation time (d)	max hatchling r.t.s.	Still living inside	Empty egg shells	Unfertilized eggs	Fertilized eggs	Dead hatch-lings	Dead embryos	Total number of eggs
C24	17.7	45	65	0	65	3	70	0	5	73
C25	19.7	46	62	4	68	5	80	6	12	85
C26	22.7	49	57	0	58	0	60	1	2	60
C27	24.7	51	71	26	71	0	79	0	8	79
S1	secret	secret	110	0	114	5	117	4	3	122
S2	secret	secret	82	0	87	2	87	3	0	89
S3	secret	secret	81	0	84	1	84	3	0	85
S4	secret	secret	110	3	115	1	115	5	0	116
S5	secret	secret	62	0	65	0	70	3	5	70
S6	secret	secret	15	0	28	16	73	13	45	89
S7	secret	secret	61	3	74	2	83	13	9	85
S8	secret	secret	32	3	43	0	45	11	2	45
Total			**2066**	**137**	**2241**	**109**	**2671**	**182**	**414**	**2780**

As evident in table 1 the total number of eggs in each nest had a high variability. The nest with the smallest number of eggs is nest C3 with 22 eggs, and the nest with the highest number of eggs is Secret nest 1 with 122 eggs.

The incubation time of each nest was also very different. The hatchlings from nest C13 needed the longest time (52 days) to hatch, whereas the hatchlings from nest C12 only needed 42 days. Two of the nests, C3 and C10, had no accurate incubation period because either there were no hatchlings (nest C3) or the only surviving hatchlings were found during the excavation (nest C10). The incubation times of the secret nests were unknown because there were no data about their nesting date.

During the whole breeding season a total number of 2780 eggs were laid, which can be divided into the total number of fertilized eggs and into the total number of unfertilized eggs. 2671 (96.1%) eggs were fertilized and 109 (3.9%) were unfertilized (Figure 1).

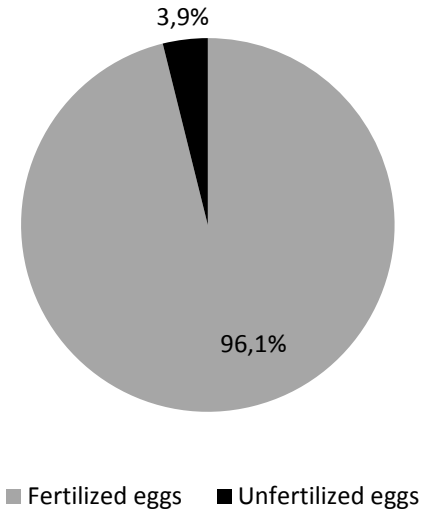

Figure 1: Percentage of fertilized and unfertilized eggs laid in Çalış in 2013
Abbildung 1: Prozentsatz von befruchteten und unbefruchteten Eiern, die in Çalış 2013 gelegt wurden

Not all of the eggs in the nests were able to hatch and reach the sea. The difference can be explained by the number of unfertilized eggs, dead embryos and dead hatchlings. The biggest difference is evident at nest C10, where 96 eggs were found but only a maximum of 5 hatchlings made it to the sea. The smallest difference was at nest C13, where 75 eggs were laid in total and a maximum of 74 hatchlings reached the sea (Figure 2).

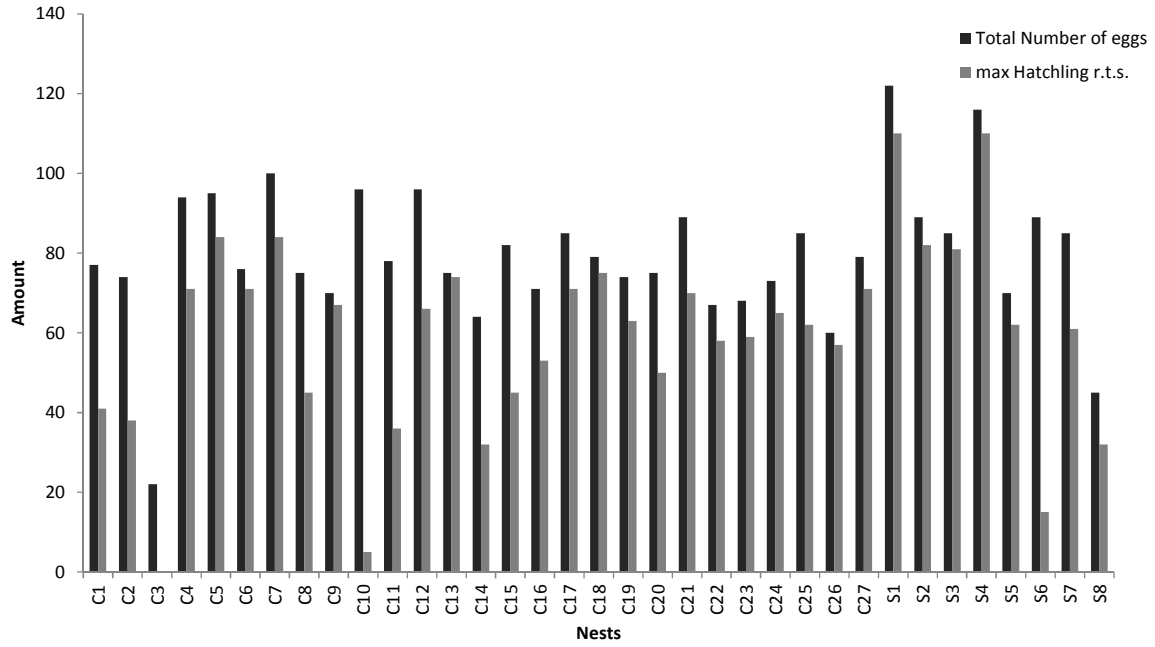

Figure 2: Total number of eggs in each nest in comparison to the maximum number of hatchlings reaching the sea
Abbildung 2: Gesamtanzahl der Eier in den Nestern im Vergleich zur maximalen Anzahl der Hatchlinge, die das Meer erreichten

During the excavations, dead embryos were distinguished in stages, i.e. in early, middle and late stage. Only nest C17, Secret nest 2, 3 and 4 had no dead embryos at all. The largest number of dead embryos was found in nest C10 (88 dead embryos; Figure 3).

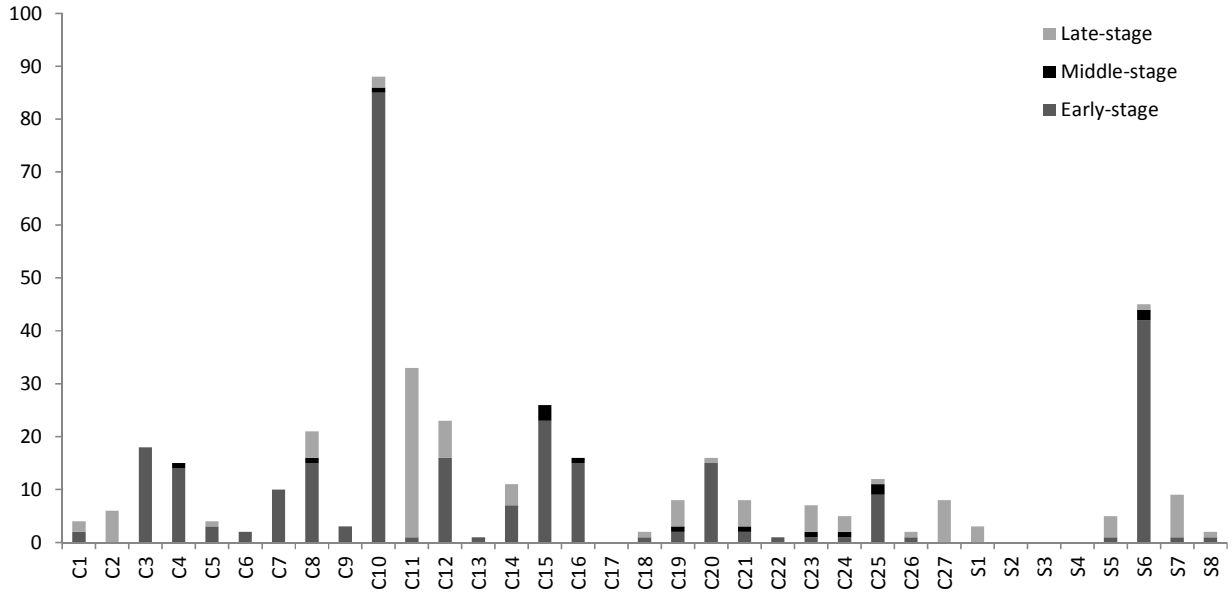

Figure 3: Number of dead embryos in each nest separated in early, middle and late embryo stage
Abbildung 3: Anzahl der toten Embryos gegliedert in frühe, mittel und späte Embryos

1. Nest description (see nesting map in "the nesting season of *Caretta caretta*" in this volume)

The first nest in Çalış started with hatching on the 9 July and the last one ended to hatch on the 13 September, which means the whole hatching season lasted 76 days. In this period a maximum of 2066 hatchlings reached the sea.

Table 2: Nest data of nest C1 (r.t.s.: reaching the sea)
Tabelle 2: Nestdaten des Nests C1

Nest: C1	
Total number of eggs	**77**
Nr. of empty egg shells	50
Nr. of hatchlings r.t.s. (maximum)	**41**
Nr. of unfertilized eggs	14
Nr. of dead embryos	4
Nr. of dead hatchlings	9
Nr. of predated hatchlings	0
Success rate of the eggs:	53.2%

Nest C1 was laid on 29 May in front of Sanat Koşeci. The distance to the sea was 10.6 m. The nest started to hatch on 16 July, equivalent to an incubation time of 48 days. On 20 July the last 3 hatchlings emerged from the nest; afterwards there were 3 days with no more hatching, so the excavation was set on 24 July. During the excavation, 50 empty egg shells, 9 dead hatchlings (stuck in the egg), 14 unfertilized eggs, 2 early-embryonic stage embryos and 2 late-embryonic stage embryos were found. The success rate of the eggs in this nest was 53.2%, which was calculated by multiplying the number of hatchlings reaching the sea with 100 and divided this number through the total number of eggs in the nest (Table 2).

Table 3: Nest data of nest C2 (r.t.s.: reaching the sea)
Tabelle 3: Nestdaten des Nests C2

Nest: C2	
Total number of eggs	**74**
Nr. of empty egg shells	48
Nr. of hatchlings r.t.s. (maximum)	**38**
Nr. of unfertilized eggs	13
Nr. of dead embryos	6
Nr. of dead hatchlings	17
Nr. of predated hatchlings	0
Success rate of the eggs:	51.4%

Nest C2 was located between Bambu Restaurant and Bambu Bar and was laid on 30 May. The distance to the sea was 12 m. The first hatchlings started to emerge on 18 July, equivalent to an incubation time of 49 days. The excavation was conducted 4 days after the last hatching, on 25 July. During the excavation, 13 dead hatchlings were found inside the nest, whereby 7 of them were stuck in the egg. The other 4 dead hatchlings died because they emerged too early in the afternoon and died due to the heat (Table 3).

Table 4: Nest data of nest C3 (r.t.s.: reaching the sea)
Tabelle 4: Nestdaten des Nests C3

Nest: C3	
Total number of eggs	**22**
Nr. of empty egg shells	0
Nr. of hatchlings r.t.s. (maximum)	**0**
Nr. of unfertilized eggs	4
Nr. of dead embryos	18
Nr. of dead hatchlings	0
Nr. of predated hatchlings	0
Success rate of the eggs:	0%

Nest C3 was a Hatchery, which means that the position of the nest was relocated due to bad conditions of the original location. The new location of the nest was in front of the restaurant Çalış Lezzet Bahcesi at a distance of 13.3 m from the sea. The hatchery was done before the students of the Austrian team came to Çaliş. The excavation was conducted more than 2 months after the nesting date because no hatchling emerged from the nest. Nest C3 had the lowest number of eggs and also the lowest success rate because none of the eggs hatched (Table 4).

Table 5: Nest data of nest C4 (r.t.s.: reaching the sea)
Tabelle 5: Nestdaten des Nests C4

Nest: C4	
Total number of eggs	**94**
Nr. of empty egg shells	74
Nr. of hatchlings r.t.s. (maximum)	**73**
Nr. of unfertilized eggs	5
Nr. of dead embryos	15
Nr. of dead hatchlings	3
Nr. of predated hatchlings	1
Success rate of the eggs:	77.7%

Nest C4 was laid in front of Sanat Koşeci on 30 May. The distance to the sea was 13.3 m. The first hatchlings started to emerge on the 18th of July, which means that the incubation time lasted 49 days. The excavation took place three days after the last hatching. During the excavation one hatchling was found alive inside the nest, but also two dead hatchlings were found. The other dead hatchling listed in table 5 was dead due to predation by a dog (Table 5).

Table 6: Nest data of nest C5 (r.t.s.: reaching the sea)
Tabelle 6: Nestdaten des Nests C5

Nest: C5	
Total number of eggs	**95**
Nr. of empty egg shells	91
Nr. of hatchlings r.t.s. (maximum)	**84**
Nr. of unfertilized eggs	0
Nr. of dead embryos	4
Nr. of dead hatchlings	7
Nr. of predated hatchlings	0
Success rate of the eggs:	88.4%

Nest C5 was laid on 10 June between Enya and Palms Restaurant. It was located 13 m from the sea. The first hatchling started to hatch on 30 July, i.e. an incubation time of 51 days. This nest had the second longest incubation time of all nests, but also a very high success rate (Table 6).

During the excavation, three dead hatchlings were found inside the nest, the other four hatchlings died because of the heat. These four hatchlings started to emerge very early in the evening and one of them was very small and underdeveloped.

Table 7: Nest data of nest C6 (r.t.s.: reaching the sea)
Tabelle 7: Nestdaten des Nests C6

Nest: C6	
Total number of eggs	**76**
Nr. of empty egg shells	73
Nr. of hatchlings r.t.s. (maximum)	**71**
Nr. of unfertilized eggs	1
Nr. of dead embryos	2
Nr. of dead hatchlings	2
Nr. of predated hatchlings	0
Success rate of the eggs:	93.4%

Nest C6 was laid in front of the Çalış Beach Restaurant on 10 June. The hatching period started on 30 July and lasted until 1 August. The nest was 13 m from the sea. The excavation took place eight days after the last hatching. During the excavation two dead hatchlings and two dead embryos in the early-embryonic stage were found inside the nest (Table 7).

Table 8: Nest data of nest C7 (r.t.s.: reaching the sea)
Tabelle 8: Nestdaten des Nests C7

Nest: C7	
Total number of eggs	**100**
Nr. of empty egg shells	89
Nr. of hatchlings r.t.s. (maximum)	**84**
Nr. of unfertilized eggs	1
Nr. of dead embryos	10
Nr. of dead hatchlings	5
Nr. of predated hatchlings	5
Success rate of the eggs:	84.0%

Nest C7 was located in front of the Güneş Hotel and was laid on 14 June. The distance to the sea was about 10.4 m. The excavation took place five days after the last hatching. During the excavation, 10 early-embryonic stage embryos were found (Table 8).

Table 9: Nest data of nest C8 (r.t.s.: reaching the sea)
Tabelle 9: Nestdaten des Nests C8

Nest: C8	
Total number of eggs	**75**
Nr. of empty egg shells	48
Nr. of hatchlings r.t.s. (maximum)	**45**
Nr. of unfertilized eggs	6
Nr. of dead embryos	21
Nr. of dead hatchlings	3
Nr. of predated hatchlings	0
Success rate of the eggs:	60.0%

Nest C8 was laid on the 14 June between Vojo Restaurant and Eylül Optik. The distance to the sea was 13.6 m. The first hatchling started to hatch on 28 July, which is an incubation time of 45 days. The excavation was six days after the last hatching. During the excavation it was noticed that the egg chamber was very wide at the bottom, which was probably the reason why three of the hatchlings died inside the nest. Furthermore an albino hatchling was found inside the nest (Table 9).

Table 10: Nest data of nest C9 (r.t.s.: reaching the sea)
Tabelle 10: Nestdaten des Nests C9

Nest: C9	
Total number of eggs	**70**
Nr. of empty egg shells	67
Nr. of hatchlings r.t.s. (maximum)	**67**
Nr. of unfertilized eggs	0
Nr. of dead embryos	3
Nr. of dead hatchlings	2
Nr. of predated hatchlings	2
Success rate of the eggs:	95.7%

Nest C9 was laid in front of the Güneş Market on 14 June. It was in a distance of 18.3 m from the sea. The first hatchling emerged on the 2 August, which means that the incubation time lasted 50 days. With 67 hatchlings reaching the sea, this nest had a success rate of 95.7% (Table 10).

Table 11: Nest data of nest C10 (r.t.s.: reaching the sea)
Tabelle 11: Nestdaten des Nests C10

Nest: C10	
Total number of eggs	**96**
Nr. of empty egg shells	5
Nr. of hatchlings r.t.s. (maximum)	**5**
Nr. of unfertilized eggs	3
Nr. of dead embryos	88
Nr. of dead hatchlings	0
Nr. of predated hatchlings	0
Success rate of the eggs:	5.2%

Nest C10 was laid on 15 June in front of the Hamsi Café. The distance to the sea was 8.56 m. This nest was also a hatchery, i.e. the nest was relocated before the Austrian students arrived in Çaliş. Of 96 eggs in total, only a maximum of 5 hatchlings reached the sea, which yields a low success rate of 5.2% (Table 11).
Most of the dead embryos died in the early-embryonic stage.

Table 12: Nest data of nest C11 (r.t.s.: reaching the sea)
Tabelle 12: Nestdaten des Nests C11

Nest: C11	
Total number of eggs	**78**
Nr. of empty egg shells	44
Nr. of hatchlings r.t.s. (maximum)	**36**
Nr. of unfertilized eggs	1
Nr. of dead embryos	33
Nr. of dead hatchlings	8
Nr. of predated hatchlings	0
Success rate of the eggs:	46.2%

Nest C11 was laid on 22 June in front of the Çeren Hotel at a distance to the sea of 21.3 m. The first hatchling emerged after an incubation time of 45 days. During the excavation which was set six days after the last hatching, six dead hatchlings and 33 dead embryos were found inside the nest. 32 of the dead embryos were in the late-embryonic stage, the other one died in the early-embryonic stage. Two dead hatchlings were found during the hatching period: both died because of the heat (Table 12).

Table 13: Nest data of nest C12 (r.t.s.: reaching the sea)
Tabelle 13: Nestdaten des Nests C12

Nest: C12	
Total number of eggs	**96**
Nr. of empty egg shells	70
Nr. of hatchlings r.t.s. (maximum)	**66**
Nr. of unfertilized eggs	3
Nr. of dead embryos	23
Nr. of dead hatchlings	4
Nr. of predated hatchlings	0
Success rate of the eggs:	68.8%

Nest C12 was laid on 26 June in front of the Caretta Beach Club. The distance to the sea was 27.5 m. After an incubation time of 42 days, the first hatchling started to hatch. C12 is the nest with the shortest incubation time of all nests in Çaliş. The excavation took place six days after the last hatching. During the excavation, two dead hatchlings and 23 dead embryos were found. The other two dead hatchlings listed in table 13 died because of the heat. 16 of the 23 dead embryos were in the early-embryonic stage, the other 7 died in their late-embryonic stage (Table 13).

Table 14: Nest data of nest C13 (r.t.s.: reaching the sea)
Tabelle 14: Nestdaten des Nests C13

Nest: C13	
Total number of eggs	**75**
Nr. of empty egg shells	74
Nr. of hatchlings r.t.s. (maximum)	**74**
Nr. of unfertilized eggs	0
Nr. of dead embryos	1
Nr. of dead hatchlings	0
Nr. of predated hatchlings	0
Success rate of the eggs:	98.7%

Nest C13 was laid on 27 June in front of Hotel Idee at a distance to the sea of 11.15 m. The first hatchling emerged after an incubation time of 52 days, which is also the longest incubation time of all nests. This nest not only had the longest incubation time, but also the highest success rate, 98.7% (Table 14).

Table 15: Nest data of nest C14 (r.t.s.: reaching the sea)
Tabelle 15: Nestdaten des Nests C14

Nest: C14	
Total number of eggs	**64**
Nr. of empty egg shells	45
Nr. of hatchlings r.t.s. (maximum)	**32**
Nr. of unfertilized eggs	8
Nr. of dead embryos	11
Nr. of dead hatchlings	13
Nr. of predated hatchlings	0
Success rate of the eggs:	50.0%

Nest C14 was laid on 28 June in the middle part of the picnic area, 19 m away from the sea. After an incubation time of 50 days the first hatchlings came out. This was the only day, the nest hatched. Five days later the nest got excavated, where 35 living hatchlings were fetched out but unfortunately seven of them died before releasing (Table 15).

Table 16: Nest data of nest C15 (r.t.s.: reaching the sea)
Tabelle 16: Nestdaten des Nests C15

Nest: C15	
Total number of eggs	**82**
Nr. of empty egg shells	45
Nr. of hatchlings r.t.s. (maximum)	**45**
Nr. of unfertilized eggs	11
Nr. of dead embryos	26
Nr. of dead hatchlings	0
Nr. of predated hatchlings	0
Success rate of the eggs:	54.9%

Nest C15 was laid on 29 June in front of the restaurant Lily's Steak house. The first hatchling came out on 14 August and so there was an incubation time of 47 days. This nest had a really long hatching period, so the excavation was not before 24 August. In the nest, one dry egg was found (Table 16).

Table 17: Nest data of nest C16 (r.t.s.: reaching the sea)
Tabelle 17: Nestdaten des Nests C16

Nest: C16	
Total number of eggs	**71**
Nr. of empty egg shells	54
Nr. of hatchlings r.t.s. (maximum)	**53**
Nr. of unfertilized eggs	1
Nr. of dead embryos	16
Nr. of dead hatchlings	1
Nr. of predated hatchlings	0
Success rate of the eggs:	74.6%

Nest C16 was found on 30 June in front of the Caretta Beach Club. It was located about 27 m away from the sea next to the wall and had an incubation time of 45 days. On the first hatching day eleven hatchlings were released by an employee of a nearby hotel. Even though every morning the sand was very wet because the garden of the hotel next to the nest was watered, there was a success rate of 74.6%. There were insect larvae found in the nest (Table 17).

Table 18: Nest data of nest C17 (r.t.s.: reaching the sea)
Tabelle 18: Nestdaten des Nests C17

Nest: C17	
Total number of eggs	**85**
Nr. of empty egg shells	85
Nr. of hatchlings r.t.s. (maximum)	**71**
Nr. of unfertilized eggs	0
Nr. of dead embryos	0
Nr. of dead hatchlings	14
Nr. of predated hatchlings	0
Success rate of the eggs:	83.5%

Nest C17 was laid on 1 July in front of Türkü Çadiri. The distance to the sea was 13 m. The first hatchling came out on 14 August and the incubation time was 45 days. On the second hatching day an empty egg shell was found on top of the nest. Also a fishing line was found inside the nest during the excavation (Table 18).

Table 19: Nest data of nest C18 (r.t.s.: reaching the sea)
Tabelle 19: Nestdaten des Nests C18

Nest: C18	
Total number of eggs	**79**
Nr. of empty egg shells	76
Nr. of hatchlings r.t.s. (maximum)	**75**
Nr. of unfertilized eggs	1
Nr. of dead embryos	2
Nr. of dead hatchlings	1
Nr. of predated hatchlings	0
Success rate of the eggs:	94.9%

Nest C18 was laid on 2 July in front of the Güneş Market at a distance of 14.8 m to the sea. The first hatching day was on 17 August, corresponding to an incubation time of 47 days. With a value of 94.9% the success rate of the eggs was very high (Table 19).

Table 20: Nest data of nest C19 (r.t.s.: reaching the sea)
Tabelle 20: Nestdaten des Nests C19

Nest: C19	
Total number of eggs	**74**
Nr. of empty egg shells	66
Nr. of hatchlings r.t.s. (maximum)	**63**
Nr. of unfertilized eggs	10
Nr. of dead embryos	8
Nr. of dead hatchlings	3
Nr. of predated hatchlings	0
Success rate of the eggs:	85.1%

Nest C19 was laid on 3 July in front of the Caretta Beach Club with a distance to the sea of 18.6 m. The first hatchling came out after an incubation time of 48 days. During the excavation 11 living hatchlings were found with very strong deformations of the flippers as well as of the carapace. Two of them died before release (Table 20).

Table 21: Nest data of nest C20 (r.t.s.: reaching the sea)
Tabelle 21: Nestdaten des Nests C20

Nest: C20	
Total number of eggs	**75**
Nr. of empty egg shells	59
Nr. of hatchlings r.t.s. (maximum)	**50**
Nr. of unfertilized eggs	0
Nr. of dead embryos	16
Nr. of dead hatchlings	9
Nr. of predated hatchlings	0
Success rate of the eggs:	66.7%

Nest C20 was laid on 3 July. It was a hatchery nest, i.e. a student transferred the eggs to a new place – in front of the Letoon hotel. After an incubation time of 45 days, the first hatchling emerged. The distance to the sea was 21.8 m (Table 21).

Table 22: Nest data of nest C21 (r.t.s.: reaching the sea)
Tabelle 22: Nestdaten des Nests C21

Nest: C21	
Total number of eggs	**89**
Nr. of empty egg shells	80
Nr. of hatchlings r.t.s. (maximum)	**70**
Nr. of unfertilized eggs	1
Nr. of dead embryos	8
Nr. of dead hatchlings	10
Nr. of predated hatchlings	1
Success rate of the eggs:	78.7%

Nest C21 was laid on 9 July in front of the Caretta Beach Club with a distance of 23 m to the sea. The incubation time was 46 days. The sand in the nest chamber was very hard, so it was difficult for the hatchlings to come out. Many were stuck in the nest and one hatchling was still in the shell, with only the head outside. The nine living hatchlings found during the excavation were very weak and disorientated (Table 22).

Table 23: Nest data of nest C22 (r.t.s.: reaching the sea)
Tabelle 23: Nestdaten des Nests C22

Nest: C22	
Total number of eggs	**67**
Nr. of empty egg shells	65
Nr. of hatchlings r.t.s. (maximum)	**58**
Nr. of unfertilized eggs	1
Nr. of dead embryos	1
Nr. of dead hatchlings	5
Nr. of predated hatchlings	0
Success rate of the eggs:	86.6%

Nest C22 was laid on 10 July at the beginning of the picnic area and had an incubation time of 43 days. The location of the nest was 25.8 m away from the sea. Two living hatchlings found during the excavation died shortly before release (Table 23).

Table 24: Nest data of nest C23 (r.t.s.: reaching the sea)
Tabelle 24: Nestdaten des Nests C23

Nest: C23	
Total number of eggs	**68**
Nr. of empty egg shells	61
Nr. of hatchlings r.t.s. (maximum)	**59**
Nr. of unfertilized eggs	0
Nr. of dead embryos	7
Nr. of dead hatchlings	1
Nr. of predated hatchlings	1
Success rate of the eggs:	86.8%

Nest C23 was laid on 13 July in front of the Caretta Beach Club with a distance of 13.2 m to the sea. The first hatchling came out after an incubation time of 46 days. One dead hatchling was found outside the cage and another dead hatchling was found dried out near the nest. Two living hatchlings were found by tourists and immediately released into the sea (Table 24).

Table 25: Nest data of nest C24 (r.t.s.: reaching the sea)
Tabelle 25: Nestdaten des Nests C24

Nest: C24	
Total number of eggs	**73**
Nr. of empty egg shells	65
Nr. of hatchlings r.t.s. (maximum)	**65**
Nr. of unfertilized eggs	3
Nr. of dead embryos	5
Nr. of dead hatchlings	0
Nr. of predated hatchlings	0
Success rate of the eggs:	89.0%

Nest C24 was laid on 17 July in front of the Surf Café with a distance of 18.4 m to the sea. The incubation time was 45 days (Table 25).

Table 26: Nest data of nest C25 (r.t.s.: reaching the sea)
Tabelle 26: Nestdaten des Nests C25

Nest: C25	
Total number of eggs	**85**
Nr. of empty egg shells	68
Nr. of hatchlings r.t.s. (maximum)	**62**
Nr. of unfertilized eggs	5
Nr. of dead embryos	12
Nr. of dead hatchlings	5
Nr. of predated hatchlings	1
Success rate of the eggs:	72.9%

Nest C25 was laid on 19 July. It was a hatchery and the new site was at the beginning of the picnic area, 19.5 m away from the sea. The first hatchling came out on 3 September, so the incubation time was 46 days (Table 26).

Table 27: Nest data of nest C26 (r.t.s.: reaching the sea)
Tabelle 27: Nestdaten des Nests C26

Nest: C26	
Total number of eggs	**60**
Nr. of empty egg shells	58
Nr. of hatchlings r.t.s. (maximum)	**57**
Nr. of unfertilized eggs	0
Nr. of dead embryos	2
Nr. of dead hatchlings	0
Nr. of predated hatchlings	1
Success rate of the eggs:	95.0%

Nest C26 was laid on 22 July at the picnic area. The distance to the sea was 13.6 m and the incubation time was 49 days. One hatchling was found in a cat's mouth. The success rate was 95% (Table 27).

Table 28: Nest data of nest C27 (r.t.s.: reaching the sea)
Tabelle 28: Nestdaten des Nests C27

Nest: C27	
Total number of eggs	**79**
Nr. of empty egg shells	71
Nr. of hatchlings r.t.s. (maximum)	**71**
Nr. of unfertilized eggs	0
Nr. of dead embryos	8
Nr. of dead hatchlings	0
Nr. of predated eggs	0
Success rate of the eggs:	89.9%

Nest C27 was laid on 24 July in front of Keyif Café, 9.8 m away from the sea. There was only one hatching day and, two days later, during the excavation, 26 living hatchlings were found. This nest contained no dead hatchlings (Table 28).

Table 29: Nest data of nest S1 (r.t.s.: reaching the sea)
Tabelle 29: Nestdaten des Nests S1

Nest: S1	
Total number of eggs	**122**
Nr. of empty egg shells	114
Nr. of hatchlings r.t.s. (maximum)	**110**
Nr. of unfertilized eggs	5
Nr. of dead embryos	3
Nr. of dead hatchlings	4
Nr. of predated hatchlings	4
Success rate of the eggs:	90.2%

Nest S1 was the first secret nest and also the first hatching nest in Çalış in summer 2013. The nesting date of this nest is unknown, which also makes the incubation time unknown. Its distance to the sea was 26.83 m. The first hatchling started to emerge on the 9 July, which marked the beginning of the hatching period. Nest S1 had the highest number of eggs of all nests in Çaliş. Compared with the nest with the lowest number of eggs (C3), it had 100 eggs more (Table 29 and Table 4).

When the first hatchlings emerged, it was very difficult to track them because the nest was located on the end of the beach (Çalış Tepe), where the stones are large and the tracks hardly

visible. Additionally, almost all of the tracks led away from the sea to some lamps, where predators such as dogs and birds ate them.

Table 30: Nest data of nest S2 (r.t.s.: reaching the sea)
Tabelle 30: Nestdaten des Nests S2

Nest: S2	
Total number of eggs	**89**
Nr. of empty egg shells	87
Nr. of hatchlings r.t.s. (maximum)	**82**
Nr. of unfertilized eggs	2
Nr. of dead embryos	0
Nr. of dead hatchlings	5
Nr. of predated hatchlings	0
Success rate of the eggs:	92.1%

Nest S2 was also a secret nest and was located in front of the Surf Café 29.65 m from the waterline. The nest was found during a morning shift. Almost all of the tracks led in the wrong direction and two of the hatchlings died: they were run over by a car on the nearby street. Two dead hatchlings were found inside the nest during the excavation, which took place five days after the last hatching. The last dead hatchling listed on table 30 died due to the heat after it ran a long time in the wrong direction, before members of the Austrian team found it (Table 30).

Table 31: Nest data of nest S3 (r.t.s.: reaching the sea)
Tabelle 31: Nestdaten des Nests S3

Nest: S3	
Total number of eggs	**85**
Nr. of empty egg shells	84
Nr. of hatchlings r.t.s. (maximum)	**81**
Nr. of unfertilized eggs	1
Nr. of dead embryos	0
Nr. of dead hatchlings	3
Nr. of predated hatchlings	3
Success rate of the eggs:	95.3%

Nest S3 was a secret nest located in front of the Surf Center in a distance of 30.5 m from the sea. The nest was found during a night shift and the first hatchlings were found by the restaurant owner. Before the Austrian team came to the nest, two hatchlings were predated by a dog and a cat and the third one was run over by a car. During the excavation, which was set 3 days later, only one unfertilized egg and no dead embryo were found (Table 31).

Table 32: Nest data of nest S4 (r.t.s.: reaching the sea)
Tabelle 32: Nestdaten des Nests S4

Nest: S4	
Total number of eggs	**116**
Nr. of empty egg shells	115
Nr. of hatchlings r.t.s. (maximum)	**110**
Nr. of unfertilized eggs	1
Nr. of dead embryos	0
Nr. of dead hatchlings	5
Nr. of predated hatchlings	2
Success rate of the eggs:	94.8%

S4 was a secret nest laid at the end of the beach (Çalış Tepe), 29.1 m from the sea. This nest was found during the morning shift on 26 July. Some of the tracks ended suddenly, leading members of the team to assume that predators ate the hatchlings. Two days later the position of the cage had been changed and no longer covered the nest: almost all hatchlings ran in the wrong direction. It was very hard to track them because during this night four cars and also many people were on the beach. The tracks of the hatchlings were difficult to find inside the tracks of the cars and the footprints. Additionally the beach there had many big stones so that the tracks were poorly visible. During the excavation, 2 days after the last hatching, two dead hatchlings were found inside the nest, and the last dead hatchling listed in table 32 died due to heat (Table 32).

Table 33: Nest data of nest S5 (r.t.s.: reaching the sea)
Tabelle 33: Nestdaten des Nests S5

Nest: S5	
Total number of eggs	**70**
Nr. of empty egg shells	65
Nr. of hatchlings r.t.s. (maximum)	**62**
Nr. of unfertilized eggs	0
Nr. of dead embryos	5
Nr. of dead hatchlings	2
Nr. of predated hatchlings	1
Success rate of the eggs:	88.6%

The secret nest S5 was found on 1 August in front of the Surf Café, 24.3 m away from the sea. 14 tracks were found, whereof 13 went towards the sea and one in the wrong direction. This track suddenly stopped, so the hatchling was no doubt predated. Furthermore, two dead hatchlings were found inside the nest. One of the late-embryonic stage hatchlings was infested with dipteran larvae (Table 33).

Table 34: Nest data of nest S6 (r.t.s.: reaching the sea)
Tabelle 34: Nestdaten des Nests S6

Nest: S6	
Total number of eggs	**89**
Nr. of empty egg shells	28
Nr. of hatchlings r.t.s. (maximum)	**15**
Nr. of unfertilized eggs	16
Nr. of dead embryos	45
Nr. of dead hatchlings	3
Nr. of predated hatchlings	10
Success rate of the eggs:	16.9%

S6 was a secret nest laid in front of the Güneş Market, 19.1 m from the sea. On 3 August, 10 tracks and five hatchlings were found. Unfortunately all of the tracks ended at one point or another and they were assumed to be predated. One of the five hatchlings was found on the beach and the other four by digging into the nest. Another dead hatchling was found next to the nest. It died due to the sun (Table 34).

Table 35: Nest data of nest S7 (r.t.s.: reaching the sea)
Tabelle 35: Nestdaten des Nests S7

Nest: S7	
Total number of eggs	**85**
Nr. of empty egg shells	74
Nr. of hatchlings r.t.s. (maximum)	**61**
Nr. of unfertilized eggs	2
Nr. of dead embryos	9
Nr. of dead hatchlings	13
Nr. of predated hatchlings	10
Success rate of the eggs:	71.8%

Secret nest S7 was found on 19 August in front of the Sunset Hotel, 20.6 m from the sea. Although the moon was full, the hatchlings were very disorientated. Additionally, their eyes were clotted. On the first day, four tracks and 16 hatchlings were found, on the second day only one hatchling was found. On the third day, 44 hatchlings came out, although the sand was very hard, almost like cement (Table 35).

Table 36: Nest data of nest S8 (r.t.s.: reaching the sea)
Tabelle 36: Nestdaten des Nests S8

Nest: S8	
Total number of eggs	**45**
Nr. of empty egg shells	43
Nr. of hatchlings r.t.s. (maximum)	**32**
Nr. of unfertilized eggs	0
Nr. of dead embryos	2
Nr. of dead hatchlings	11
Nr. of predated hatchlings	0
Success rate of the eggs:	71.1%

Secret nest S8 was found on 20 August in front of the Caretta Beach Club. The distance to the sea was 18.3 m. One hatchling was found dead on the beach next to the cage. Many cats were around the nest. Inside the nest there were coleopteran larvae. Some of the hatchlings had strong deformations (Table 36).

DISCUSSION

The Sea Turtle field course in Çalış started 20 years ago, which allows comparing the collected data over many years.

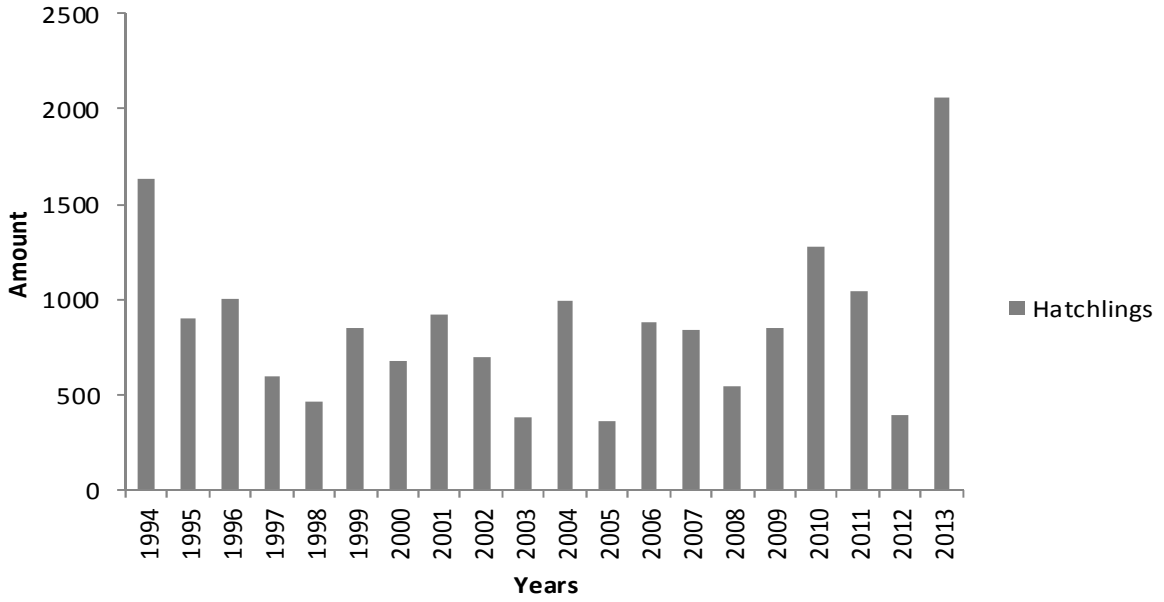

Figure 4: Maximum number of hatchlings reaching the sea in Çalış 1994-2013
Abbildung 4: Maximale Anzahl von Hatchlingen, die das Meer in Çalış erreichen über die Jahre

The maximum number of hatchlings reaching the sea differs from year to year (Fig. 4). Since 1994, the lowest number of hatchlings was in 2005 with 359. The highest number was this year with 2066; this is 428 more hatchlings than in the second highest year, i.e. at the beginning of the project in 1994.

The differences through the years can partly be explained with the very specific nesting cycle of the loggerhead turtle. Studies show that females don't nest every year, but only once in every 2 to 4 years (Spotila 2004).

One potential explanation for the high number of hatchlings this year is the early beginning of the nesting season and its long duration. Additionally, because of the field course the turtles were more protected, perhaps reducing the disturbance by the visitors. But the results of the research and monitoring efforts are not instantly recognizable because it takes the females 20-25 years to become mature and return to the beach again. Since the project started 20 years ago it may be possible, that some of the female turtles from 1994 are returning to the beach, which also could explain the high number of turtles this year.

Importantly, in the past years there was a decreasing trend in the number of hatchlings and also of nesting turtles. One big problem for them is people on the beach and along the promenade. This is associated with noise and light. Loggerhead turtles are shy and would be dis-

turbed by any noise during the search of a good nesting place (Miller et al. 2003). Çalış Beach is open for tourism, which means that there are many people on the beach, also during the night. During the shifts the Austrian students often saw bonfires, large picnics at the so-called picnic area, and once even a party on the beach.

Not only is noise a problem; light pollution may also help explain why the population has been decreasing in the last years. The adult turtles are sensitive to light. If they see a bright light on the beach during their search for a good nesting place, it is likely that they turn around and go back to the sea (Witherington 1992).

These problems do not only affect adult turtles, but also the hatchlings. Studies proved that artificial light disturbs hatchling orientation, leading to disorientation or disorientation (Lorne and Salmon 2007).

However, artificial light is not the only reason why *Caretta caretta* is endangered. One estimate is that only one hatchling of a thousand reaches maturity and mates with other turtles (Razer 1986). This is why the project is so important, because the more hatchlings reach the sea the more are likely to survive.

This year the average number of eggs per nest was 79 (SD±17.6) in Çaliş. Comparing this with other nesting beaches in the Mediterranean Sea, there are fewer eggs per nest in Çaliş.

For example, Marathonissi island (Zakynthos, Greece) had over 120 eggs per nest in 2005 (Skoufas 2005). One potential explanation is that this Greek island is private and no tourists come to this beach, which is contrary to Çaliş. In Çalış there is well-developed tourism, which no doubt has consequences for the nesting behavior of the *Caretta caretta*.

However it is not known, if the number of tourists has a direct influence on the number of laid eggs. Other reasons influencing the number of laid eggs are for example the quality of the beach or the presence of other sea turtles, which would smaller the space of possible nesting places.

It is also important where the nests are laid, because the temperature influences the incubation time and also the sex. Branches of trees or the shadow of a wall can influence the temperature inside the nest.

In 2013 the shortest incubation time was 42 days at nest C12. It was laid in front of the Caretta Beach Club. C13 had an incubation time of 52 days, which is the longest incubation time and it was laid in front of Hotel Idee. It is very interesting to compare these two nests because they were laid only one day after each other, but their incubation time is 10 days apart. When you compare the distances to the sea, C13 was closer to the sea (11.15 m); Nest C12 was about twice this distance away from the sea (27.5 m).

On the other hand, Nest C12 had 23 dead embryos, Nest C13 only one. McGehee (1990) reported that very dry nests don't have long incubation time, but they have a lower success rate than nests with a moisture level of 25%. Nests C12 and C13 seem to fit into this study.

Nest C3 was a hatchery and was laid in front of Çalış Lezzet Bahcesi in distance of 13.3 m from the sea. Although the nest was relocated because of the bad conditions of the initial nesting place, the eggs were not able to hatch.

This might have many different reasons. A hatchery is very difficult to do because the eggs have to be relocated within 12 hours, so that no blood vessels are harmed due to rotations (Limpus et al. 1979). It is also important not to alter the order of the eggs or the depth of the egg chamber. One must take into consideration that the turtle chose this place for a reason. On the other hand, if a nest is too close to the sea, it is in danger of being flooded, which can kill the hatchlings.

However, hatcheries can be very positive for the success of a nest, as is evident in the cases of nests C20 and C25. Concerning this, it is very important, that the sea turtle project in Çalış continues, so that more loggerhead turtle eggs can be saved.

This project does not only protect the sea turtles, it informs the tourists and the inhabitants as well. So they know how to behave right on the beach, without harming the nests and the turtles. The positive influence of the project can help to increase the number of the endangered *Caretta caretta*.

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APPENDIX

Fig. 5: New cage for nest protection with one side open
Abb. 5: Neuer Käfig für Nestschutz, eine Seite offen
Photo: Stefan Birngruber

Fig. 6: Old, yellow cages to protect the nests on the beach
Abb. 6: Alte, gelbe Käfige zum Schutz der Nester am Strand
Photo: Stefan Birngruber

Fig. 7: Dead embryo, early stage
Abb. 7: Toter Embryo im Frühstadium
Photo: Marina Fischer

Fig. 8: Hatchling on the way to se sea
Abb. 8: Hatchling auf dem Weg ins Meer
Photo: Marina Fischer

Fig. 9: On the left side closed eggs and on the right side opened egg shells during the excavation
Abb. 9: Auf der linken Seite geschlossene Eier und auf der rechten Seite geöffnete Eischalen während einer Excavation. Photo: Marina Fischer